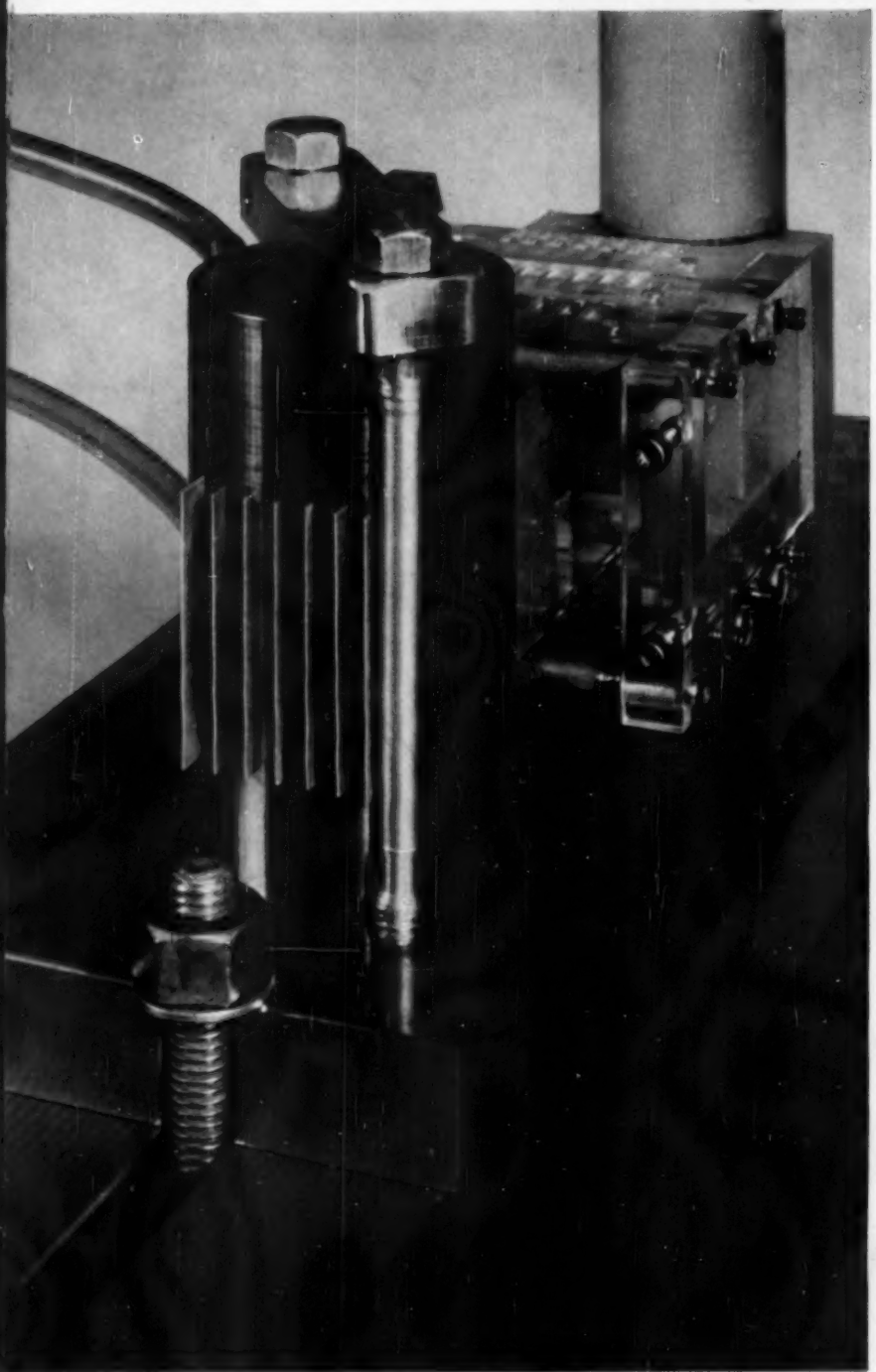
American Machinist

AUGUST 12, 1957 PRICE 75 CENTS

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

HARDNESS TESTING . . .

A SPECIAL REPORT page 133



Argonne Laboratory cuts slits in neutron chopper—see page 105

Electrical discharge cuts uranium

"Cam library" slashes screw machine costs page 101

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NEW CAM OPERATED BORE-MATIC

provides

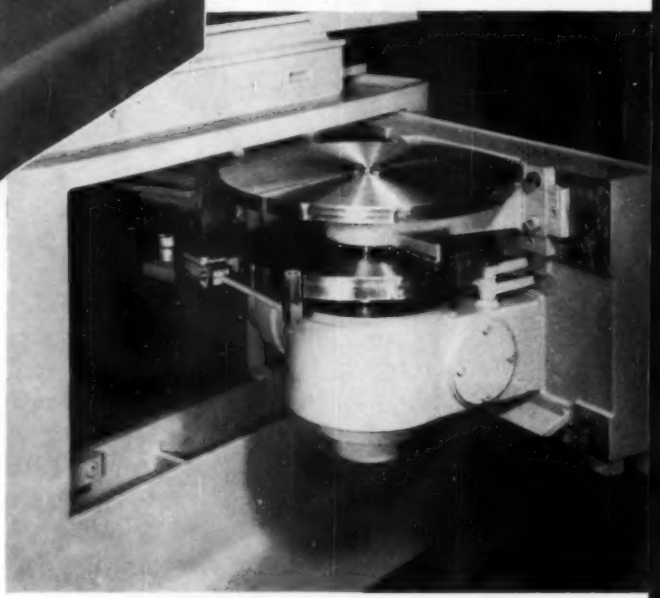
wide capacity range

for small to medium work

Heald Model 2215
Cam Operated Bore-Matic

Table Stroke	9"
Boring Stroke	5"
Table Pad	18" x 41"
Cross-Slide Stroke	4"
Cross-Slide Table Pad	13½" x 22½"

Entire cam unit and drive swings out on hinged panel for easy access. Locating pads on panel and base assure positive location of cams at all times. Wipers clean cam surfaces just prior to contact point of cam and follower at which point continuous lubrication is applied.



THIS new addition to the Heald line is designed for continuous, high-production Borizing of work where cam type operation and control are desirable. Table and cross-slide feeds are controlled by separate cams located in the machine base, each cam being so contoured as to provide the desired cycle. The cross-slide cam can also be arranged to operate cross-feed units or feed-out quills. By appropriate design of table and cross-feed cams, any combination of straight, taper or contour boring, turning, facing or grooving operations can be performed. For complete information, send for a copy of Bulletin 2-2215.

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American Machinist
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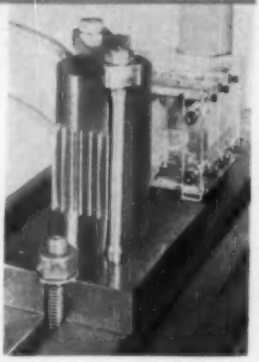

Cover . . .

Uranium cylinder is slotted by electrical discharge at Argonne National Laboratory. The Elox M-500 machine has been adapted to change feed from vertical to horizontal. For details see article on page 105.

The Big Change . . . The sparkling new cover that greeted you with this issue is only one of the changes you will find spread through this issue of *American Machinist*. All are designed to either increase the usefulness of *American Machinist* or to make it easier for you to find and use the information.

Starting with the cover, let's review these changes. Our first four-color cover was published in December, 1946. Earlier, we were one of the first technical magazines, and the first in Metalworking, to discontinue front-cover advertising. The one disadvantage we found in the color cover was that it took a lot of time to make the plates and we had difficulty in telling you about the latest developments you would find in the issue. We feel that we have arrived at a cover that combines the virtues of four-color pictures with really informative news about what you'll find inside.

A further step taken to ease your reading has been to complete the re-styling of regular departments started a few months ago. We think the new style is simpler, more modern, and will make it easier for you to find what you want.

Aircraft vs. Missiles . . . The sudden switch in military strategy from an emphasis on planes to one on missiles has had repercussions through many branches of Metalworking. We have long felt that the aviation industry had become a center of production developments and of news important to the metalworking industries and we have reported this in detail. This importance has now reached such a pitch that we think you should have an every-issue review and forecast of developments in aircraft and missiles that may affect you. It starts in this issue on page 93.

Coming . . . *AM* for August 26 headlines an unusual application of belt grinding. Other articles deal with heat treating, welding, chrome plated ways, an unusual drafting method, and some ideas on setting up a semi-automatic line.

Vincent E Lysaght, the author of the Special Report on hardness testing (page 133), is a graduate of Massachusetts Institute of Technology. He has devoted his time since then to standardization, engineering, and research in hardness testing equipment. His techniques for microhardness testing, developed in 1940, are now standard. Mr Lysaght worked all these years in engineering for the Wilson Mechanical Instrument Division, American Chain & Cable Co. Two years ago, however, he was taken out of engineering and made general sales manager of the parent corporation.

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Spur gear

Index plate

Retaining ring

How one machine hardens them all *without distortion*

You can quench any part quickly from a hot, plastic state without warpage or distortion when you work with Gleason Quenching Presses.

Since no straightening operation is necessary after hardening you save time and make a definite advance in quality control. Experience shows there is much less residual stress in non-straightened parts.

A button is pressed and the automatic quenching cycle is started. The lower die is swung back into the quenching position and the upper die descends rapidly, aligning the part while it is still in the plastic state.

Carefully controlled metallurgically correct oil circulation cools and hardens the part uniformly to preset rates.

The two dies align the part throughout cooling, allowing the part its normal contraction but keeping it true. After the quench, the part is swung out for removal.

As shown in the photograph at the left, Gleason Quenching Presses can be arranged with a completely automatic load and unload unit.

You can harden *any* part, regardless of shape, with this method. There are three presses accommodating parts up to 36″ diameter. Still another Gleason Press automatically hardens and straightens shafts and similar parts up to 4″ in diameter and 40″ long.

Write for literature on the presses. And for recommendations on the press and dies that best fit your products, send us blueprints.

The Gleason Nos. 16 and 26 Quenching Presses can be arranged with the load and unload unit. This unit makes it possible to speed production and reduce labor requirements.

GLEASON WORKS

Builders of bevel gear machinery for over 90 years

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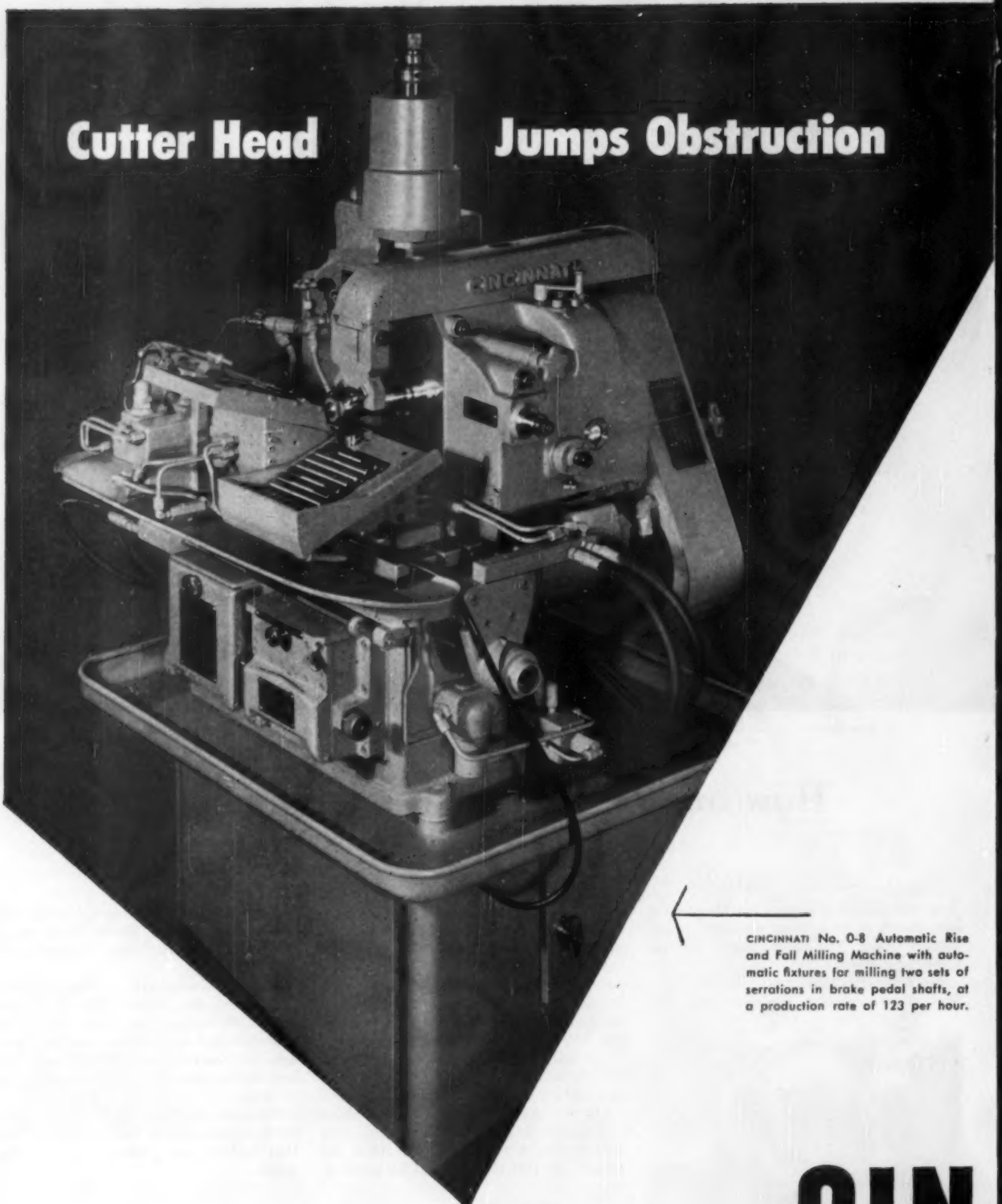
Cutter Head Jumps Obstruction



CINCINNATI No. 0-8 Automatic Rise and Fall Milling Machine with automatic fixtures for milling two sets of serrations in brake pedal shafts, at a production rate of 123 per hour.

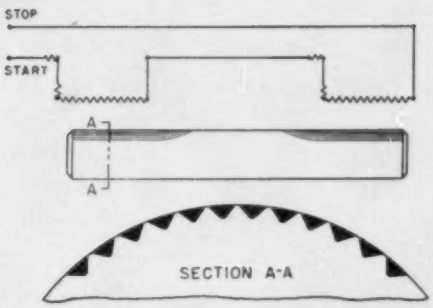
CINCINNATI

MILLING MACHINES • BROACHING MACHINES • CUTTER AND TOOL GRINDERS • SPECIAL MACHINE

...Combining Tandem Milling Operations Into One Automatic Cycle

Tandem milling operations need not be handled separately. The CINCINNATI® No. 0-8 Automatic illustrated here performs two such operations in one automatic cycle. And the tooling developed by Cincinnati's Engineering Service Specialists makes the operation completely automatic. All the operator has to do is stack work on a shelf; the machine and fixture take over the job of loading, clamping, milling and ejecting. In one operation, serrations on both ends of brake pedal shafts are milled automatically. ¶ The machine's hydraulic rise and fall feature is the deciding factor in tandem milling with intermediate obstructions. After taking the first cut, the spindle carrier automatically rises, the table repositions, and then the carrier advances down to accurate depth for the second cut. Production averages 123 shafts per hour. ¶ CINCINNATI No. 0-8 Automatics have many features of value for this type of work, and our Engineering Service Specialists have the know-how to tool up the 0-8's to your requirements. Would you like to know more about these machines? Ask for catalog No. M-1607-2. Sweet's Machine Tool File contains brief specs.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO



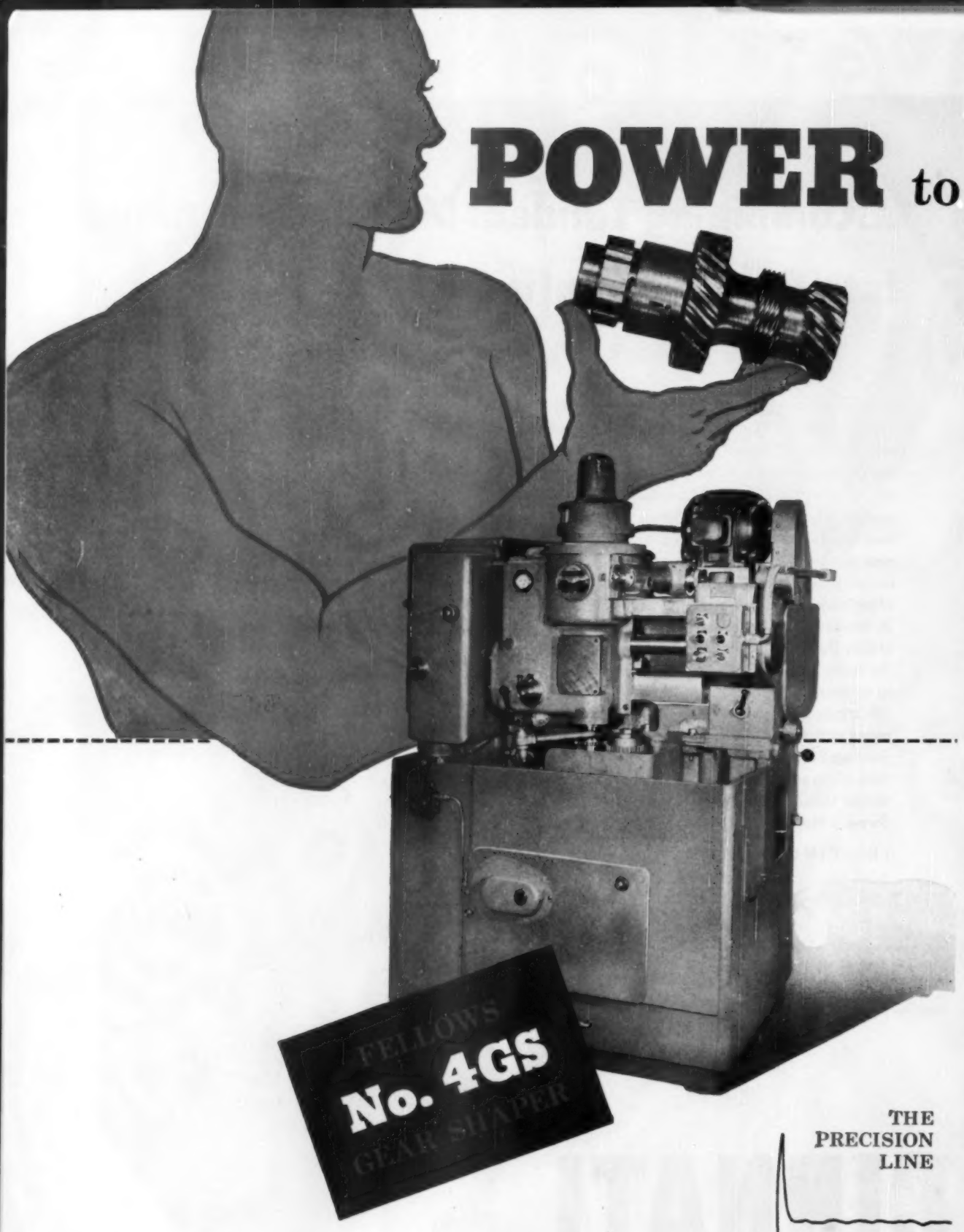
Drawing of part and diagram of automatic cycle

Part name	Brake pedal shaft
Material	Steel
Operation	Mill serrations, both ends
Cutting speed	110 ft. per minute
Table feed	12" per minute
Production	123 per hour
Equipment	CINCINNATI No. 0-8 Automatic Rise and Fall Milling Machine, with automatic fixtures

CINCINNATI No. 0-8 Automatic Rise and Fall Milling Machine. Catalog No. M-1607-2 contains complete specifications.

CINNATI

TOOLS • METAL FORMING MACHINES • HARDENING MACHINES • CUTTING FLUID • GRINDING WHEELS


POWER to
FELLOWS
No. 4GS
GEAR SHAPER
THE
PRECISION
LINE

Lower Gear Production Costs

Performance figures of Fellows No. 4GS Gear Shapers on many production lines prove that these high speed machines pay "profits" in lowered costs everywhere they're used. One major manufacturer has installed 10 new No. 4GS Gear Shapers because each cuts 30% faster than his older machines, saves in set-up time, too.

The new Fellows No. 4GS Gear Shaper finish-cuts internal and external spurs and helicals up to 6" P.D. and 2" face width, at 9 cutter speeds from 98 to 635 strokes per minute. Rigid mechanism assures close tolerances at all speeds. For large production runs, it can be readily adapted to operate semi-automatically or completely automatically. And the versatility of the No. 4GS Gear Shaper permits fast, efficient cutting of a nearly infinite variety of cams, splines and special contours.

For full information about the complete Precision Line of Fellows Gear Production and Inspection Equipment, get in touch with your Fellows representative. Write, wire or phone any Fellows office.

THE FELLOWS GEAR SHAPER COMPANY
78 River Street, Springfield, Vermont
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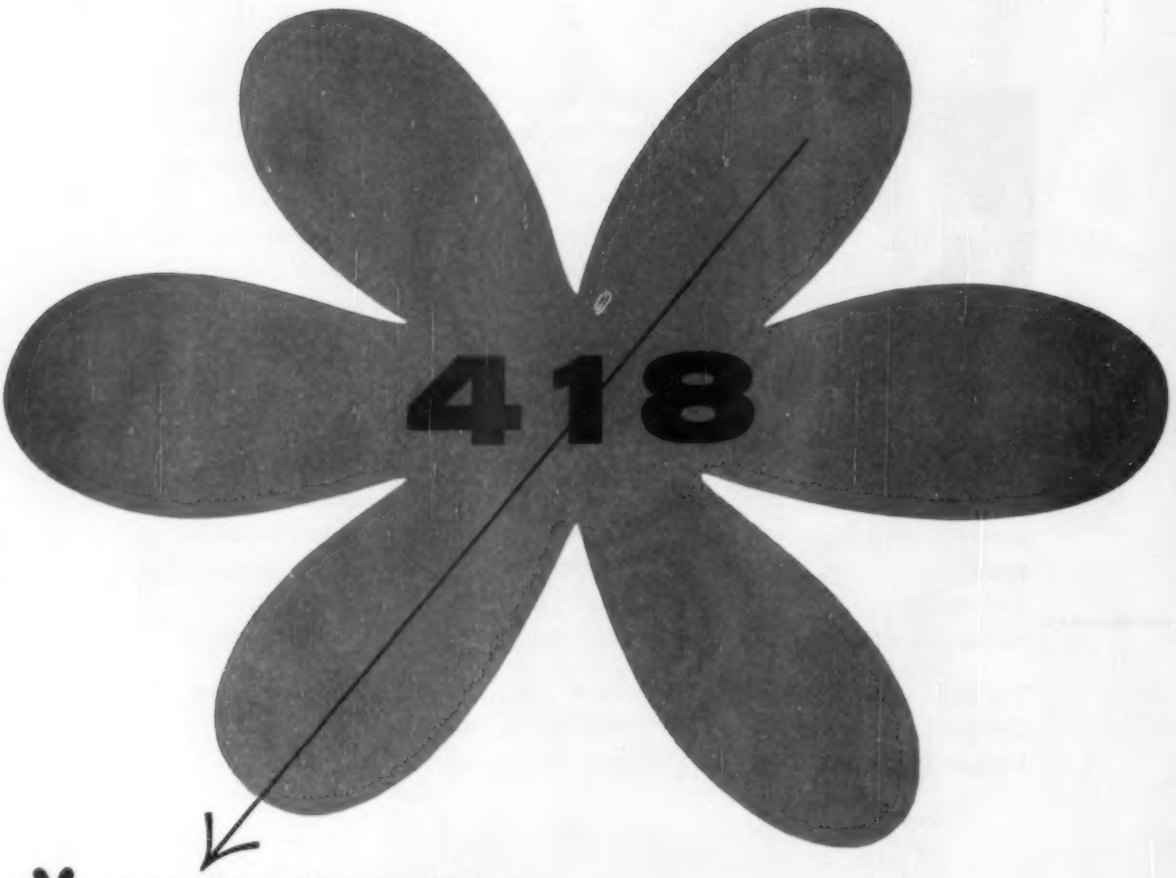
Fellows *Gear Production Equipment*

Get Accurate, Low-Cost

with a

VAN NORMAN



CYLINDRICAL GRINDER

The Van Norman 418 Cylindrical Grinder is engineered to give you fast, accurate, low-cost plunge and traverse — small parts grinding, particularly if you have small or medium sized runs.

With the 418 you get big machine economy and performance at small machine cost. Setups are quick and easy . . . workpieces are easily loaded, ground and unloaded. Get full details on the Van Norman 418 . . . write, wire or phone now for complete specifications.

VAN NORMAN MACHINE

a division of Van Norman Industries, Inc.

MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

Plunge and Traverse Grinding

The Van Norman 418 Cylindrical Grinder
Work size: 4″ diam. x 18″ length
Grinding wheel: 14″ O.D. x 2″ wide
2 HP wheel motor (3 HP optional)

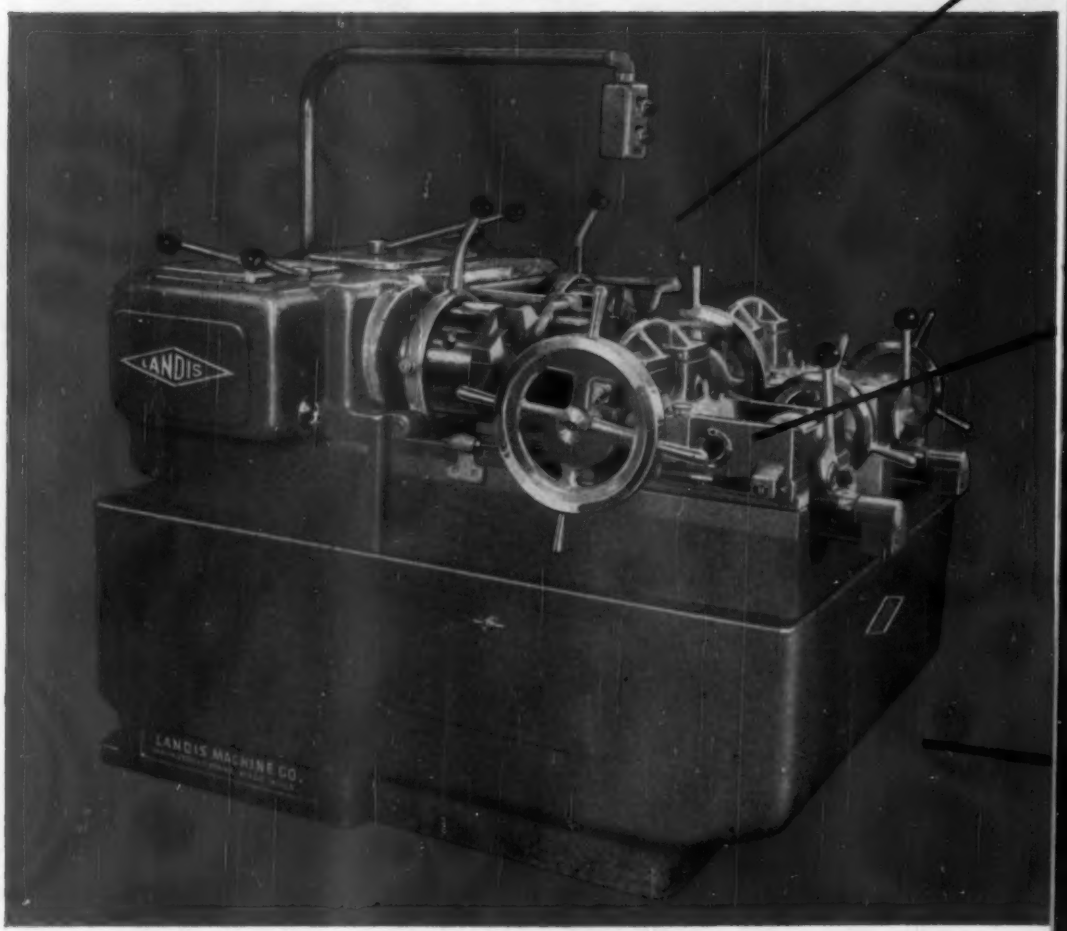
COMPANY

SPRINGFIELD 7, MASSACHUSETTS

Don't wait . . . for extra profits install a Van Norman grinder now! They are available in many purchase plans . . . Outright sale . . . Purchase on conditional sales contract up to five years . . . Pay as you depreciate up to 10 years. Conditional Sales Contracts not available to Export.

LANDMACO

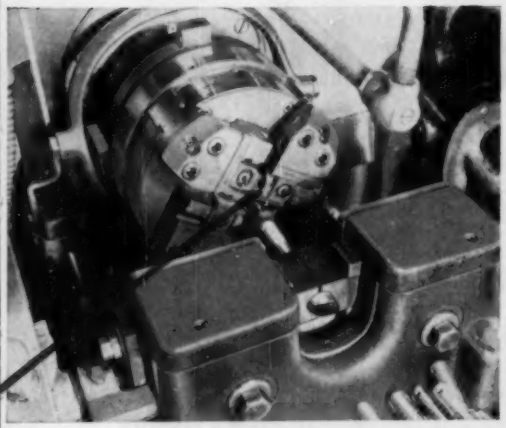
threading machines



. . . . . are built in a wide variety of models for commercial, heavy duty, and precision threading from 3/16" to 2½" in diameter.
Single or double-spindle models are available in varying bed lengths, with or without lead screw, using either of two die head styles, according to individual requirements. The die heads use LANDIS Tangential Chasers, which may be reground for 80% of their original length. Adaptation for oversize capacity and special jobs is easily made through auxiliary equipment.

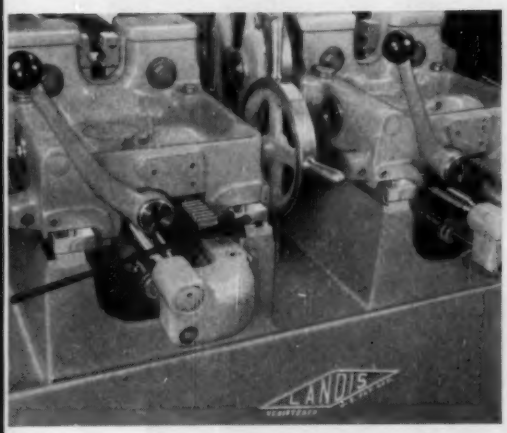
For more information, send specifications and ask for Bulletin H-76.

464C-2



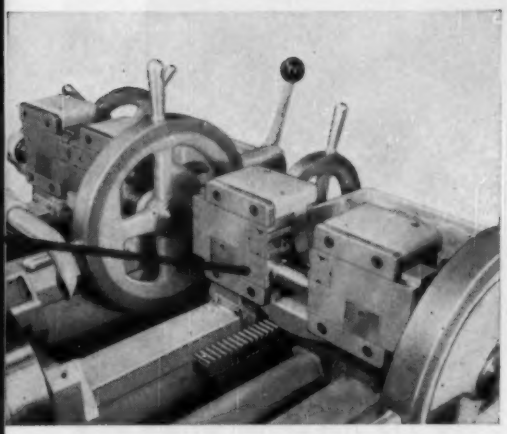
PRECISION

Hardened and Ground LANCO Die Heads combined with Lead Screw Feed enable threading to Class 4 and Class 7 tolerances. The fundamental design and specially selected and hardened materials of the die head provide the maximum rigidity required for this class work.



HEAVY-DUTY

Lead Screw Feed and rugged LANCO Heat Treated Die Heads enable the unusually heavy cuts required for producing Acme threads. Despite the heavy rate of metal removal, workpiece slippage is prevented by vise gripping power intensified by a "hammer blow" operating handwheel.

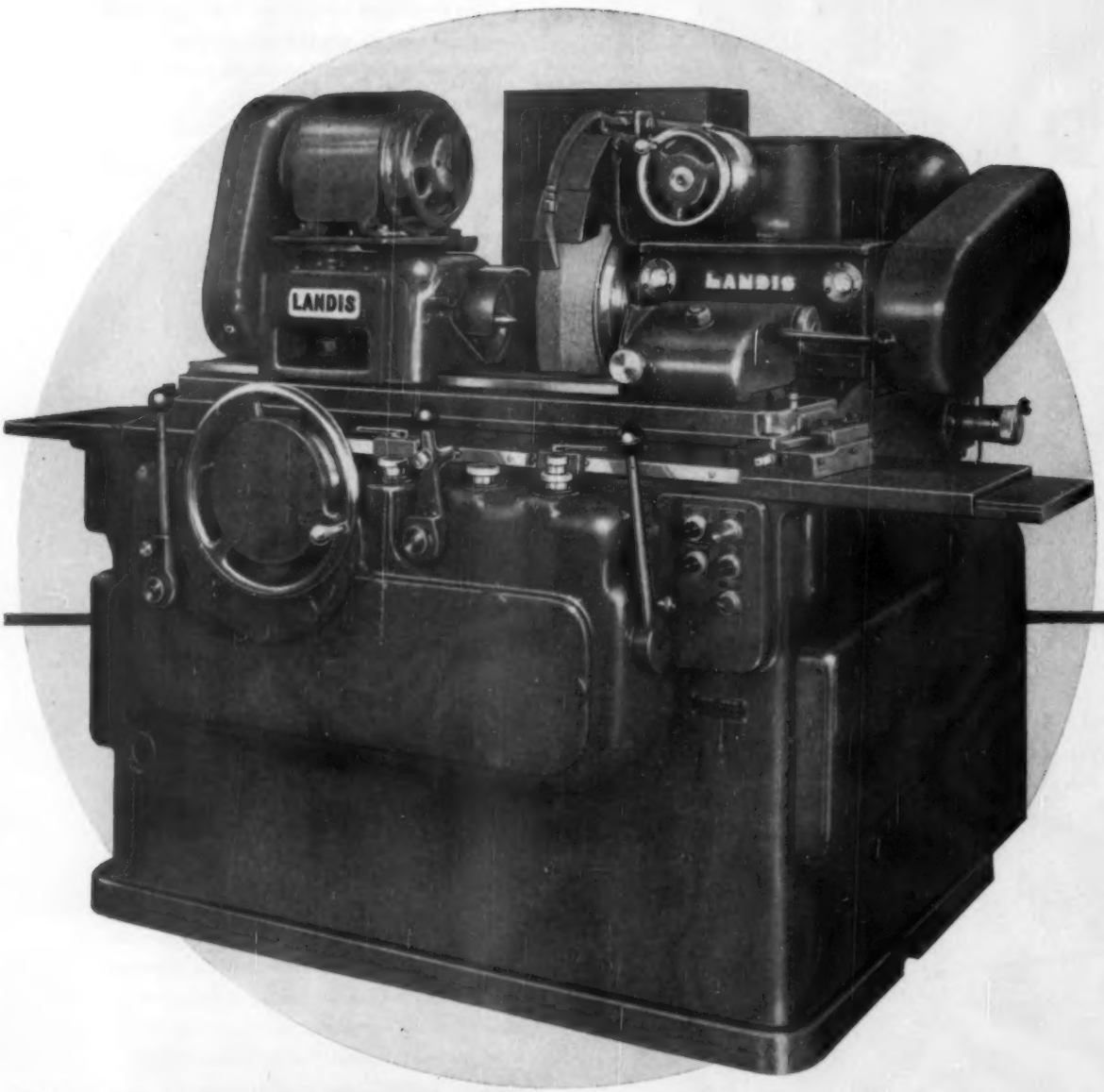


VERSATILITY

Each LANDMACO Threading Machine cuts a wide range of thread diameters—for example, the 12C LANDMACO has a standard threading range from $\frac{3}{8}$" to $1\frac{1}{2}$" in diameter, with oversize capacity to $3\frac{3}{4}$" for short thread lengths. Standard carriage vises enable the gripping of diameters larger than the machine's capacity, and special vises may be furnished. Tooling is available for Tapping, Turning, Grooving, Forming, and Facing operations.

LANDIS *Machine* COMPANY
WAYNESBORO • PENNSYLVANIA

Exclusive Landis features increase



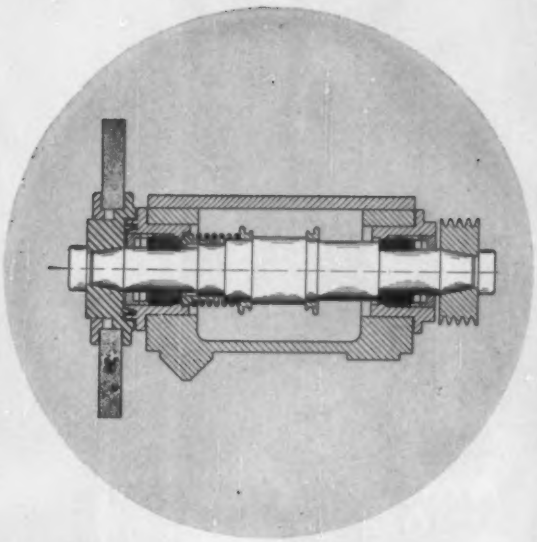
Landis 6'' x 18'' Type CH Plain Hydraulic Grinder

LANDIS

precision grinders

LANDIS TOOL COMPANY / WAYNESBORO, PENNSYLVANIA

grinder output

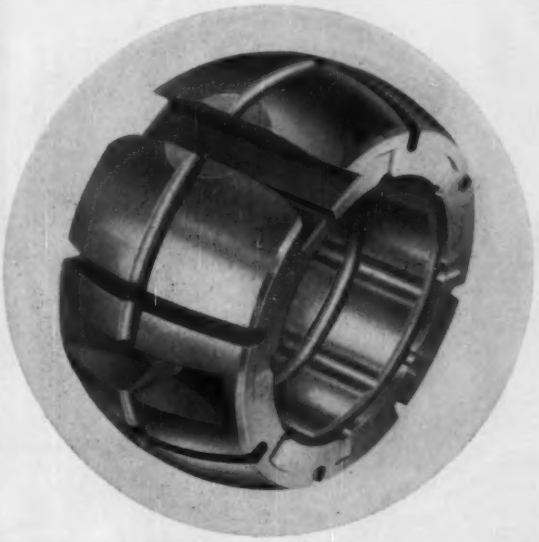


Landis heavy duty wheel spindle

Extra rigidity for fine finishes, higher production from exclusive Landis spindle design with increased diameter between microsphere bearings.

Landis microsphere spindle bearings

Extremely close running clearance of spindle bearing gives fast sparkout and sensitive response to wheel feed. Rigid, one-piece construction for heavier cuts to close tolerances.



made in 4 sizes

Suitable for traverse or infeed grinding of medium size work parts on long or short production runs.

condensed specifications	6" type CH plain	10" type LCH plain
Maximum diameter work swing	6⅜"	10¾"
Lengths between centers	18" or 30"	18" or 30"
Standard grinding wheel diameter	24"	24"
Wheel drive motor	7½ hp	7½ hp
Net weight—30" machine	6500 lbs.	6600 lbs.

Landis eye-level wheel feed

Location of grinding wheel feed handwheel permits operator to see both grinding operation and handwheel graduations from normal working position. Easier, more accurate operation saves time.

GIDDINGS & LEWIS
GIDDINGS & LEWIS
GIDDINGS & LEWIS

This new G&L machine can help you halt rising production costs

40 Series floor type Horizontal boring, drilling and milling machines offer—

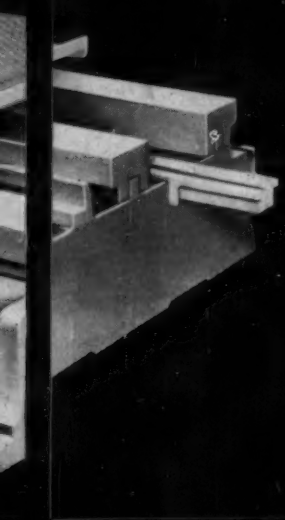
HEAVIER CUTS—Giddings & Lewis 40 Series floor type Horizontals answer today's demand for closer production tolerances, faster metal cutting, higher production . . . offering a total of 32 speeds from 3 to 800 rpm. 30 hp spindle drive motor provides ample power for highest metal removal rates — fully utilizing HSS or carbide tooling.

IMPROVED ACCURACY — All new G&L design construction provides exceptional rigidity, extra precision . . . holds dimensional accuracy at extreme limits of machine.

Choose from two G&L 40 Series 6" spindle machine types — the 460-F Floor Type and the 460-P Planer Type. Standard equipment includes non-metallic wear plates on column base, and headstock scales and adjustable verniers (.001"), telescopic vernier sights, two-way telescoping operators platform and complete independent control through multiple feed motors. Electric contour tracing control, underarm spindle support, end support and flame hardened ways on headstock column and runway are among many optional features.

In addition, a full line of accessories and attachments are available to broaden the machine's capacity or meet unusual machining requirements.

For further information on cost-slashing G&L 40 Series Horizontals, see your nearest G&L representative or write for catalog No. 40-F.

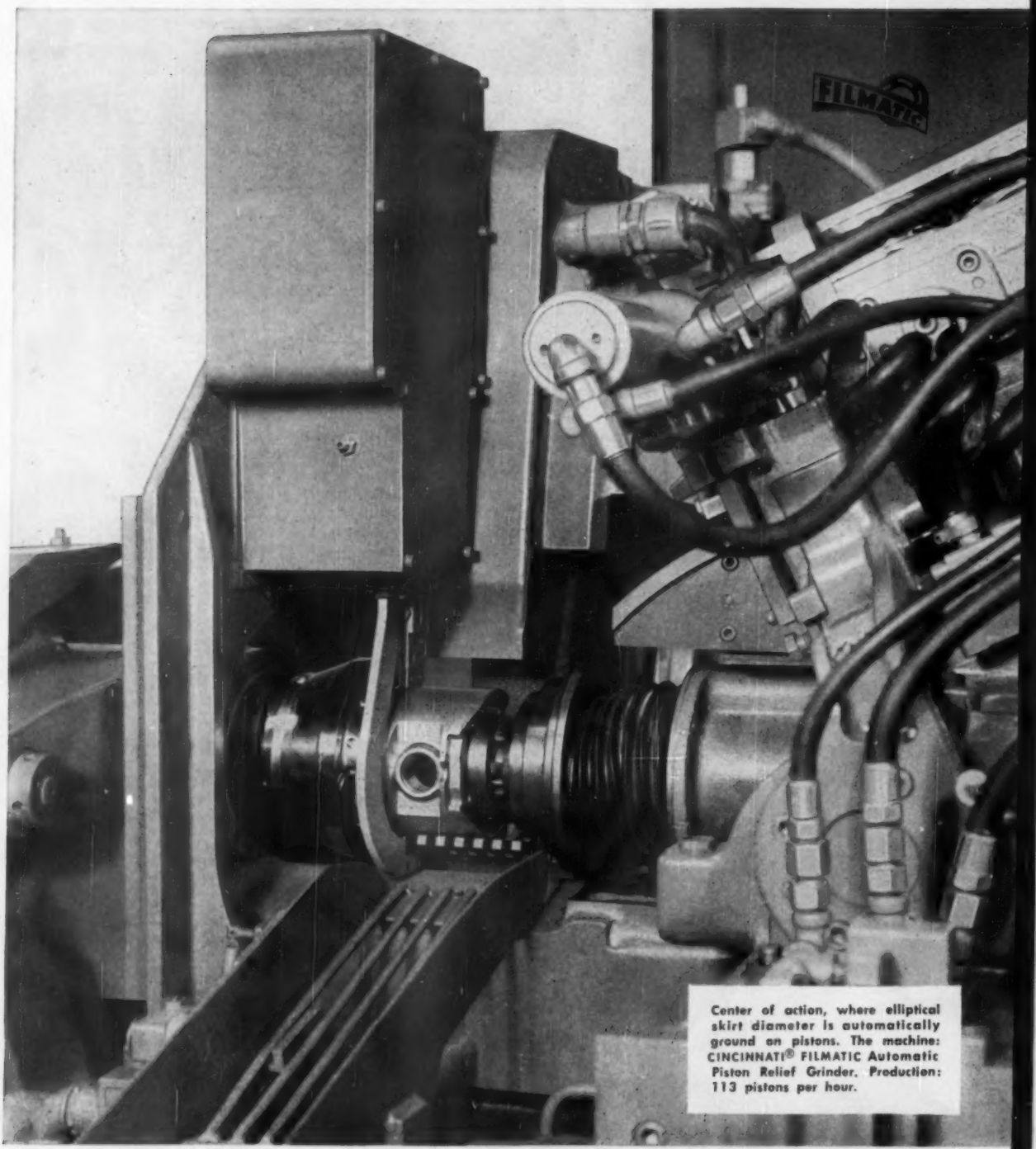


G & L *and* HYPRO DIVISION
GIDDINGS & LEWIS MACHINE TOOL CO.
FOND DU LAC, WISCONSIN G-79

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; HYPRO Double Housing and Openside Planers; Planer-Type Milling Machines; Vertical Boring Mills; Spar and Skin Milling Machines, and VARIAX Milling Machines.

Fully Automated Cincinnati

Grinds elliptical skirt diameter

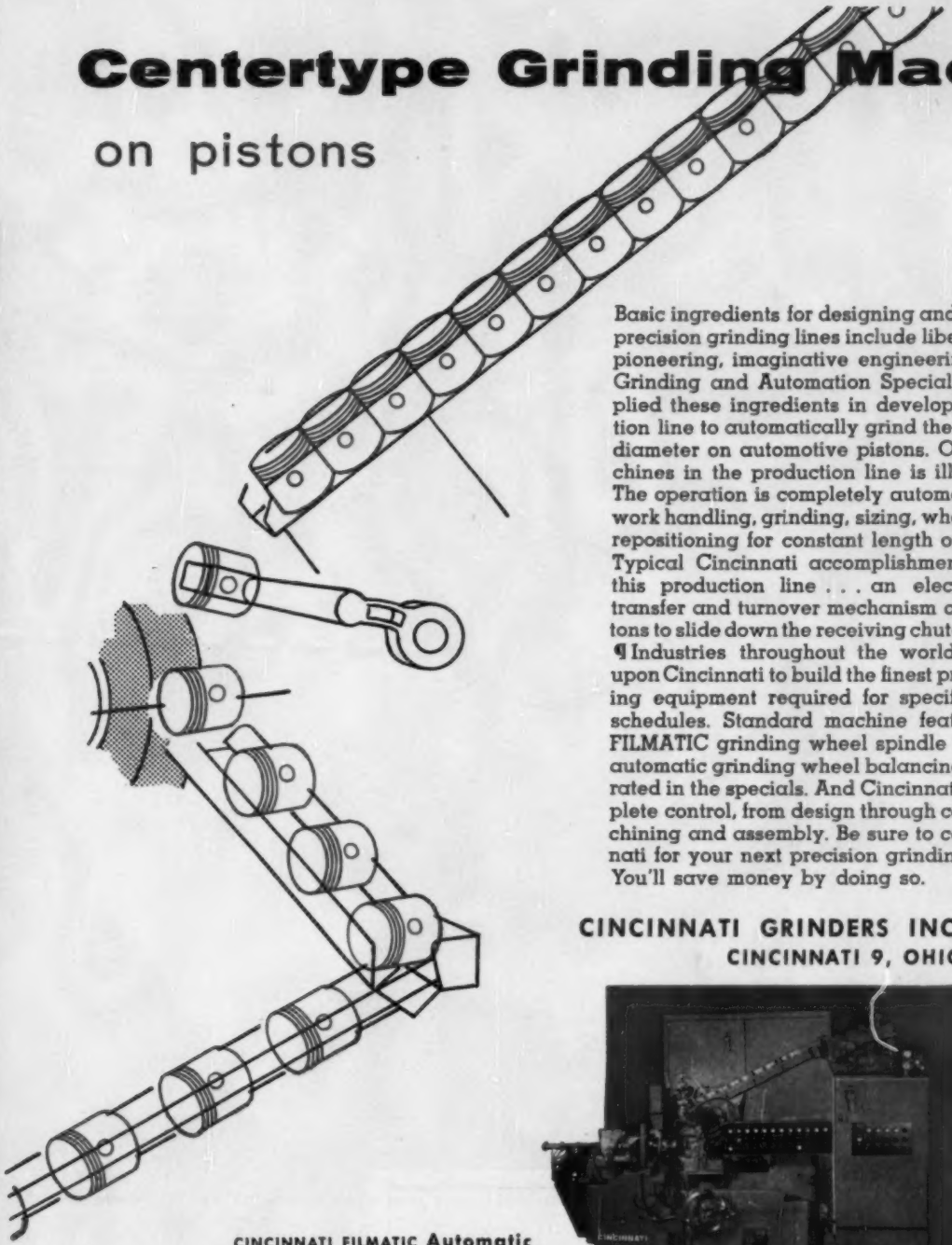


Center of action, where elliptical skirt diameter is automatically ground on pistons. The machine: CINCINNATI® FILMATIC Automatic Piston Relief Grinder. Production: 113 pistons per hour.

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES • ROLL GRINDING MACHINES • SURFACE

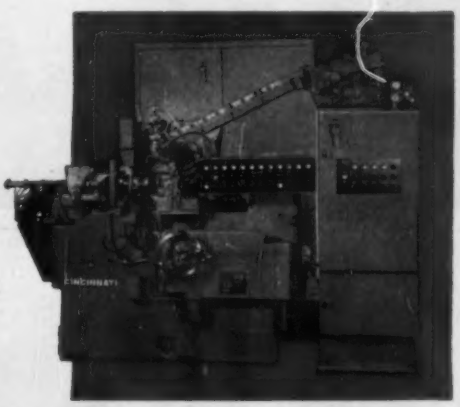
Centertype Grinding Machine

on pistons



Basic ingredients for designing and building new precision grinding lines include liberal portions of pioneering, imaginative engineering. Cincinnati Grinding and Automation Specialists freely applied these ingredients in developing a production line to automatically grind the elliptical skirt diameter on automotive pistons. One of the machines in the production line is illustrated here. The operation is completely automatic, including work handling, grinding, sizing, wheel truing, and repositioning for constant length of infeed cycle. Typical Cincinnati accomplishment in building this production line . . . an electro-pneumatic transfer and turnover mechanism orients the pistons to slide down the receiving chute head end up. ¶ Industries throughout the world can depend upon Cincinnati to build the finest precision grinding equipment required for specific production schedules. Standard machine features such as FILMATIC grinding wheel spindle bearings and automatic grinding wheel balancing are incorporated in the specials. And Cincinnati retains complete control, from design through castings to machining and assembly. Be sure to consult Cincinnati for your next precision grinding equipment. You'll save money by doing so.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

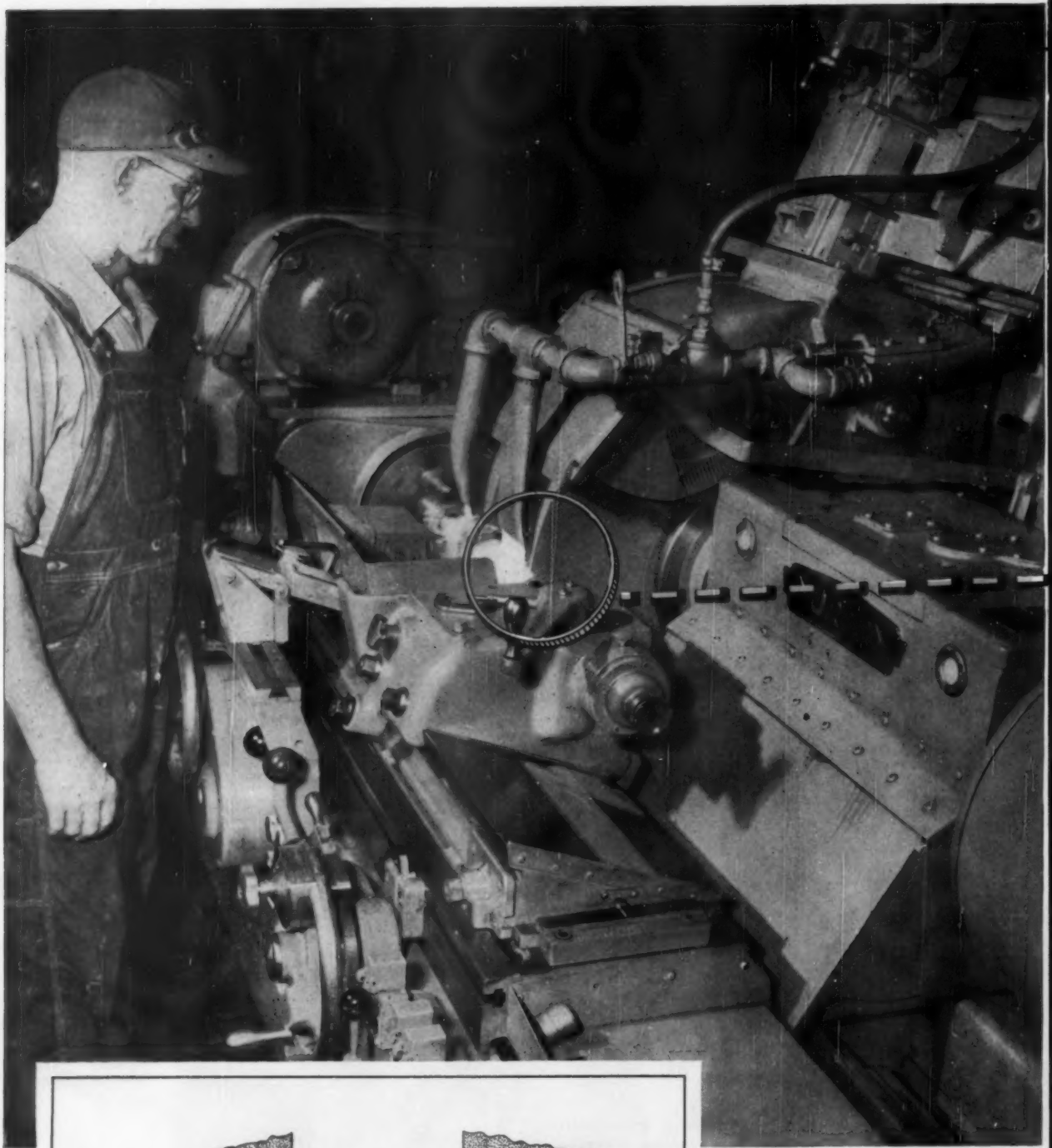


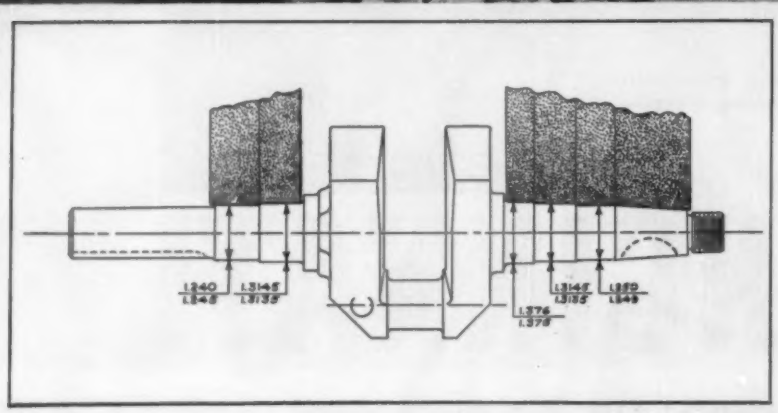
CINCINNATI FILMATIC Automatic
Piston Relief Grinding Machine

CINCINNATI

CINCINNATI

GRINDING MACHINES • CHUCKING GRINDERS • MICRO-CENTRIC GRINDING MACHINES • CENTERLESS LAPPING MACHINES

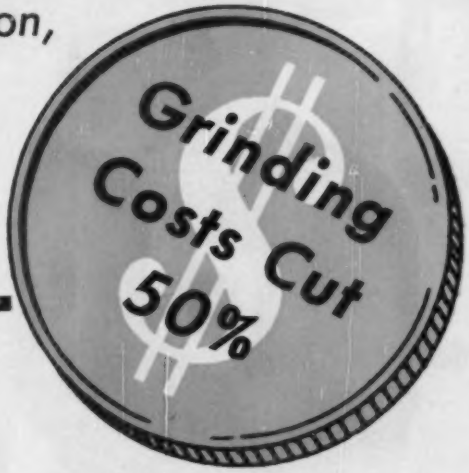




IN WISCONSIN MOTOR CORPORATION'S MILWAUKEE PLANT, crankshafts are ground on a Norton Type CTU-HD 10" semiautomatic heavy duty cylindrical grinder for approximately half what this job formerly cost. Diagram shows six simultaneous grinding operations: two diameters by wheel on left, three diameters and taper by wheel on right.

The "WISCONSIN STORY"...

Wisconsin Motor Corporation, leading manufacturers of heavy duty air-cooled engines, reports:



with this Norton Heavy Duty Grinder

Type CTU-HD machine in Milwaukee plant grinds crankshafts faster and better — at one-half previous cost!

Wisconsin Motor Corporation's endorsement of the Norton Type CTU-HD cylindrical grinder is echoed throughout industry. In plenty of other modern plants this highly advanced, heavy duty machine is doing an outstanding job of boosting production rates and profit margins.

A single 10" Type CTU-HD — or 14" Type LCTU-HD, with increased swing — replaces several separate old-type grinders. It accommodates multiple wheels widely spaced, making it ideal for many plunge cut operations. Or it will take large diameter wheels, essential on such jobs as grinding crankshaft bearings, in order to permit adequate wheel wear before interference with parts of the work.

Semiautomatic or Plain

The semiautomatic arrangement provides an adjustable, automatic grinding cycle under one-lever control. The operator merely loads and unloads, and so can handle more than one machine. Except for this feature the plain machine is identical, and both machines are arranged for fast traverse grinding.

Simplified Operation and Maintenance

All controls for feeds and speeds are set in front of machine. Wheel feed is by a precise revolving screw mechanism with click-count index, by which settings for .0001" in work diameter reduction can be made instantly, without visual check. Controls of work rotation and coolant flow are automatic. Pumps, motors, filters, relief valves, ways lubricant control valves are all outside, for easy maintenance.

For Complete Details

see your Norton Representative or write us direct. And remember: only Norton offers you such long experience in both grinding machines and wheels — your assurance of the "Touch of Gold" that helps you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

To Economize, Modernize with NEW

NORTON

GRINDERS *and* LAPPERS

Making better products... to make your products better

District Sales Offices: Worcester • Hartford • New York Area, Teterboro, New Jersey • Cleveland • Chicago • Detroit

For any counting problem...

your Veeder-Root Distributor has a ready "stock answer"

Counting problems and counter applications vary as widely as words in the dictionary. But there's one place where *all* these problems can be met and solved, quickly and at low cost.

That place is the stockroom of your Veeder-Root Distributor. There on his shelves, in the bright red, white and blue packages, are the basic Veeder-Root electrical and mechanical counters that can be adapted to machines and processes in every industry from automotive to zinc die-casting.

Sounds like a "big order." Just try him with an order and see for yourself!
For your nearest distributor, write D. G. Dresser, Veeder-Root Inc., Hartford 2, Connecticut.

Count on VEEDER-ROOT
to help you build business with Mechanical, Electrical & Hand Counters for every industrial application

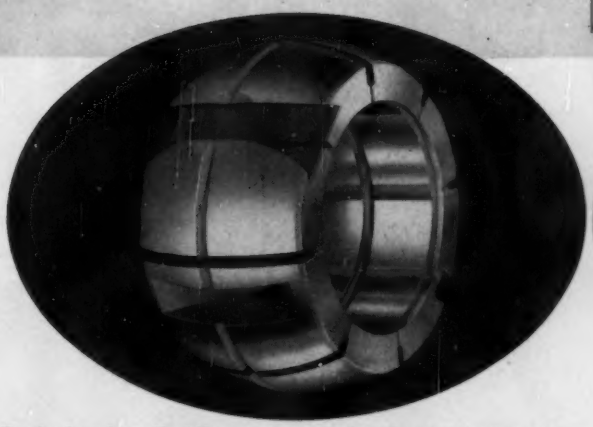
Everyone can count on
VEEDER-ROOT
"The Name that Counts"
Hartford 2, Connecticut

Landis 4" x 18" type H plain hydraulic grinder

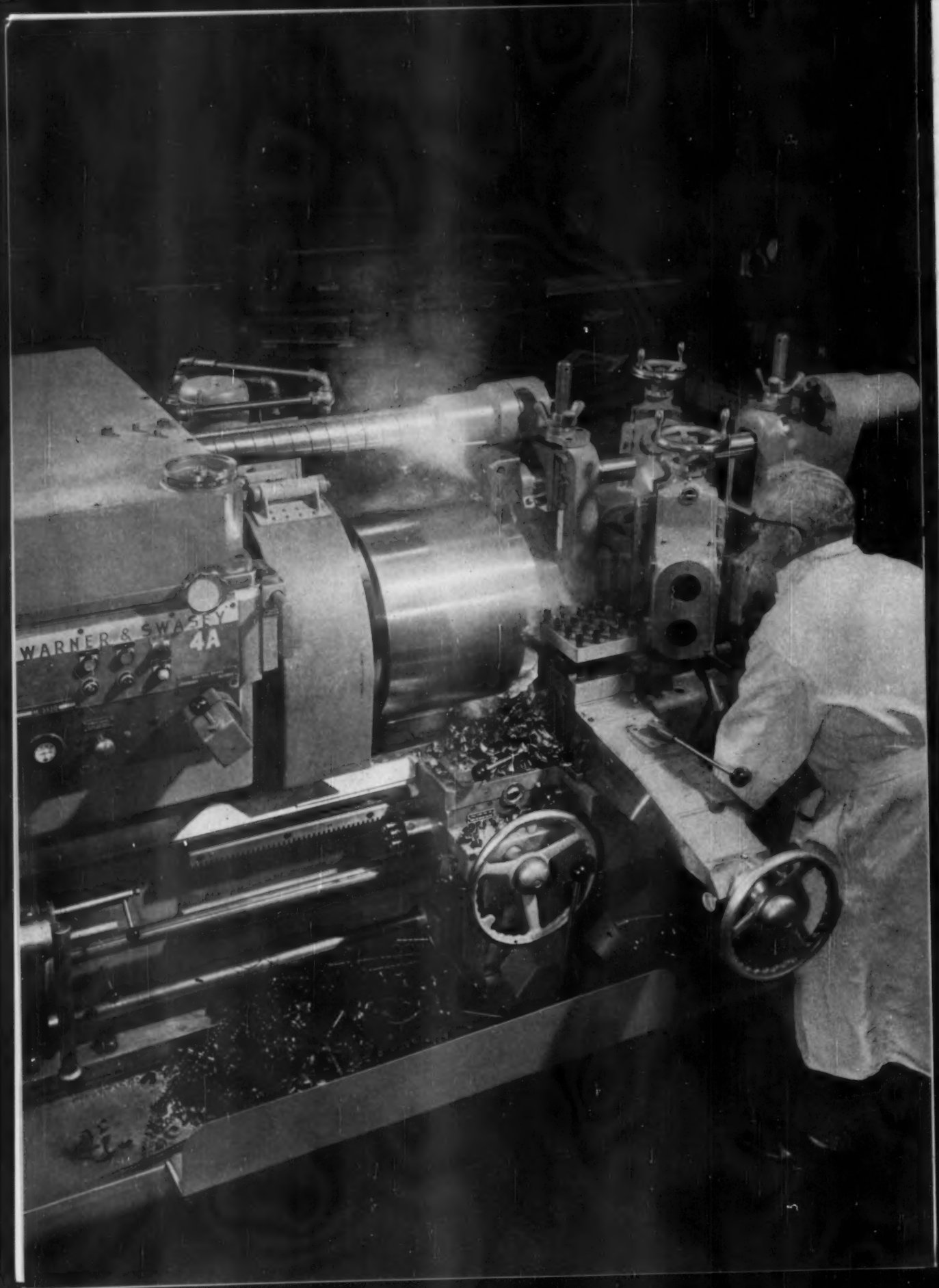
Production and precision of 4" Landis hydraulic grinder give lower cost per unit

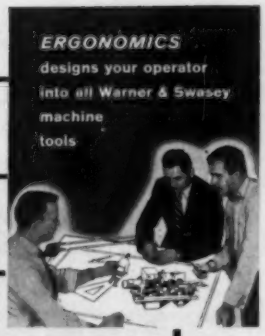
condensed specifications

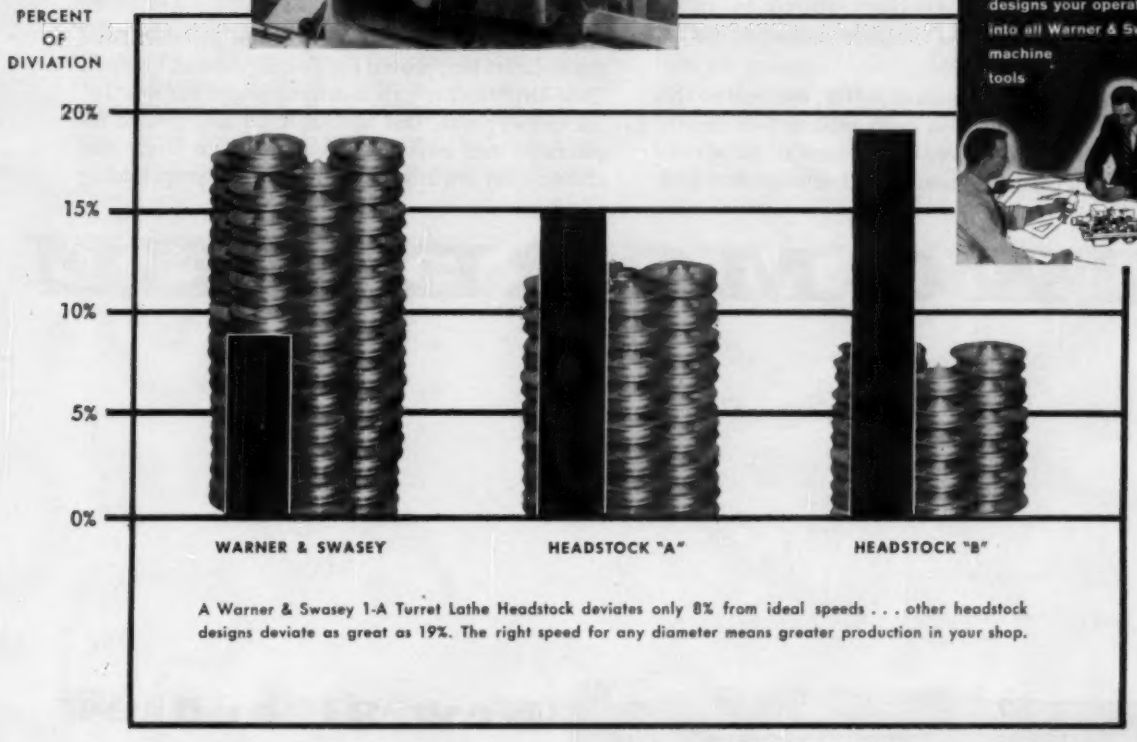
Nominal work swing	4"
Length between centers	18"
Diameter grinding wheel	16"
Wheel drive motor	3 hp.
Work speed range (rpm)	200-900
Net weight	4400 lbs.



Exclusive Landis Microsphere wheel spindle bearings . . . with closest running clearance of any spindle bearings, for added precision and shorter spark-out time.


WARNER & SWASEY
4A





A Warner & Swasey 1-A Turret Lathe Headstock deviates only 8% from ideal speeds . . . other headstock designs deviate as great as 19%. The right speed for any diameter means greater production in your shop.

Warner & Swasey hydraulic **HEADSTOCKS**

provide operators better choice of proper cutting speeds

Warner & Swasey's new, more powerful hydraulically-controlled headstocks are being hailed by turret lathe operators everywhere. They like the greater range of preselected cutting speeds — instantly available by a touch of the hand. (With a two-speed motor, they can now get twice as many *unduplicated* speeds.) Control is so easy and effective — one master lever shifts gears and handles spindle stops, starts and reverses.

Operators can easily choose in advance the most effective speed for each cut from Warner & Swasey's exclusive direct-reading Preselector. When required, it's effortlessly picked up merely by pressing the control lever. No wonder they prefer to operate Warner & Swaseys.

On Warner & Swasey's No. 4 and No. 5 Ram Type and 1-A Saddle Type Turret Lathes, direct-acting, self-adjusting hydraulic clutches with a constant mesh gear train instantaneously make the preselected speed change at the touch of a lever. Our larger Saddle Type (2-A, 3-A and 4-A) headstocks employ hydraulic pistons to shift gears after the gear train has been automatically slowed to shifting speed.

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS . . . WITH A WARNER & SWASEY

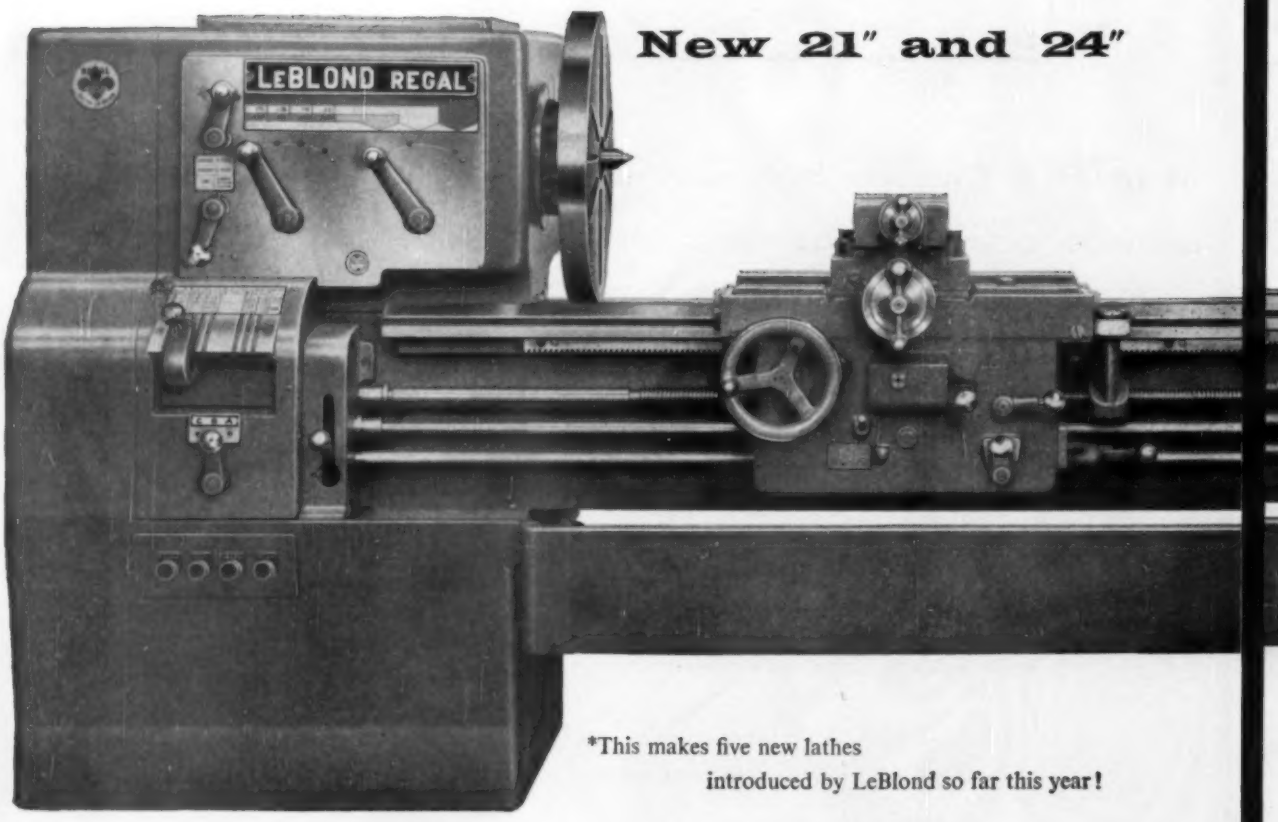
TWO MORE* ALL

The new 21″ and 24″ LeBlond Regals give you capacity, speeds and horsepower you'd find in more expensive heavy type machines offered by other builders—and at one of the most attractive prices LeBlond has ever offered!

Here's the rundown. Standard 7½ HP, optional 10 HP for high speed ranges in both models (see chart); electric clutch and brake; feed reverse at the apron; heat-treated gears in head, quick-change box and apron—plus all the famous big-lathe features that have made LeBlond Regals production favorites from coast to coast.

Headstock uses the same combination gear-belt drive construction that proved itself on the famous LeBlond Dual-Drive and is now incorporated on our new 16″ heavy-duty lathe. Bed has hardened and ground replaceable steel ways like the ways on our larger machines. They are fitted according to the compensating

TWO MORE* ALL



New 21″ and 24″

*This makes five new lathes introduced by LeBlond so far this year!

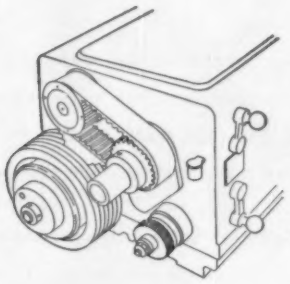
NEW LeBLONDS

veeway principle to insure better distribution of forces for proven long-time accuracy and minimum wear.

Again, like higher-priced lathes, Regals are equipped with both feed rod and preloaded precision leadscrew for continued accuracy in thread chasing. Other big-lathe features— 3 bearing spindle. Automatically-lubricated quick-change box. Wide carriage bridge with ample bearing surface. Rugged tailstock with plug clamping. In addition, you get general dimensions and construction details patterned after LeBlond heavy-duty engine lathes.

All of LeBlond's 70 years of experience has gone into the design and building of these new Regals. Only from the builder of a complete line of lathes can you get a low-priced lathe with all these big-lathe features. Get full details on the new 21" and 24" LeBlond Regal Lathes. See your LeBlond Distributor or write—Ask for Bulletin R-205A.

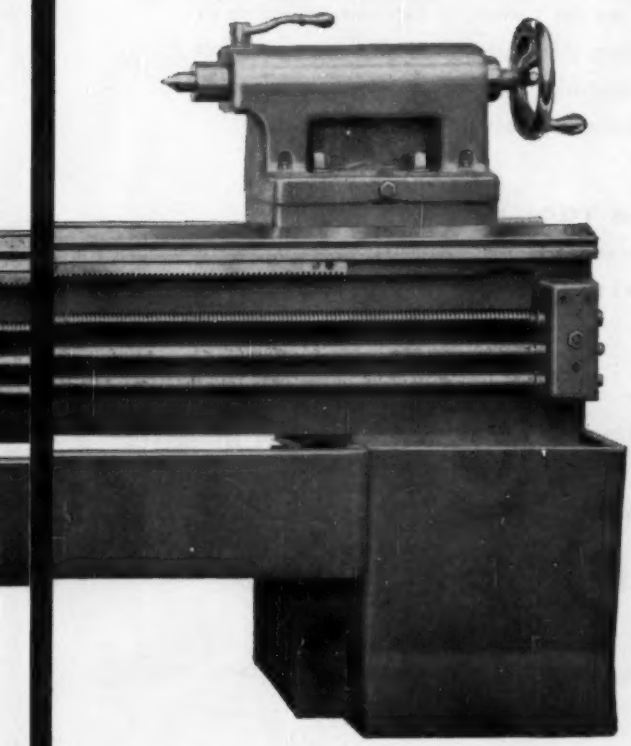
NEW LeBLONDS



Exclusive LeBlond

Combination Gear-Belt Drive

Regal lathes deliver up to 10 H.P.!



STANDARD AND OPTIONAL SPEED RANGES 21" and 24" REGALS	
12 Standard Speeds:	
Gear Drive	*18, 25, 35, 49, 70, 98, 136, 192 rpm.*
Belt Drive	*260, 362, 510, 720 rpm.*
12 Optional Speeds:	
Gear Drive	*27, 38, 53, 74, 105, 146, 204, 288 rpm.*
Belt Drive	*390, 544, 765, 1080 rpm.*

. . cut with confidence

THE R. K. LeBLOND MACHINE TOOL COMPANY

Cincinnati 8, Ohio

LeBLOND of Cincinnati

World's Largest Builder of A Complete Line of Lathes for More Than 70 Years

In the remarkable floor-to-floor time of

25 to 35 minutes
(depending on number of slots)

this jet engine Compressor Vane Inner Shroud

is completely LAPOINTE **-BROACHED**

Never having been broached before, it is easy to see why this jet engine shroud came in for some extra-close scrutiny before the final decision was made to turn the problem over to Lapointe. An important matter that needed to be settled was: how to hold such a seemingly frail part, made of *thin* alloy steel, index it exactly, *and broach without distortion.*

Lapointe engineers solved the problem to everyone's satisfaction, through the use of the special fixture shown on the opposite page. Tooling is flexible, making possible the broaching of any number of slots at any angle.

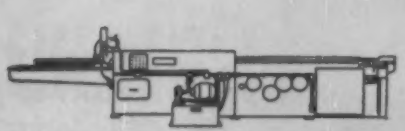
Solving difficult broaching applications is all in the day's work, at Lapointe. It's taken in stride by engineers of long experience in broaching . . . with a company that specializes exclusively in designing and building broaching machines, broaching fixtures, and broaches. Why not invite a qualified Lapointe Field Engineer to talk with you?

THE LAPOINTE MACHINE TOOL COMPANY

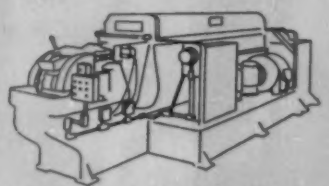
HUDSON, MASSACHUSETTS • U.S.A. *In England: Watford, Hertfordshire*

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

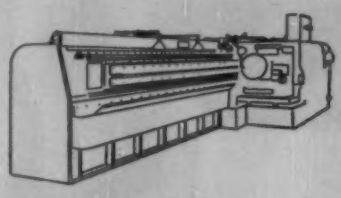
Here's a line of ELECTRO-MOTIVE DRIVE BROACHING MACHINES . . . . . available only at LAPOINTE



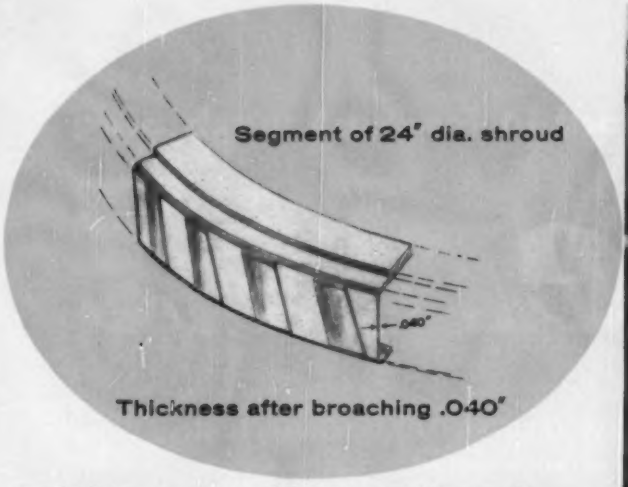
60" STROKE HORIZONTAL, ELECTRIC



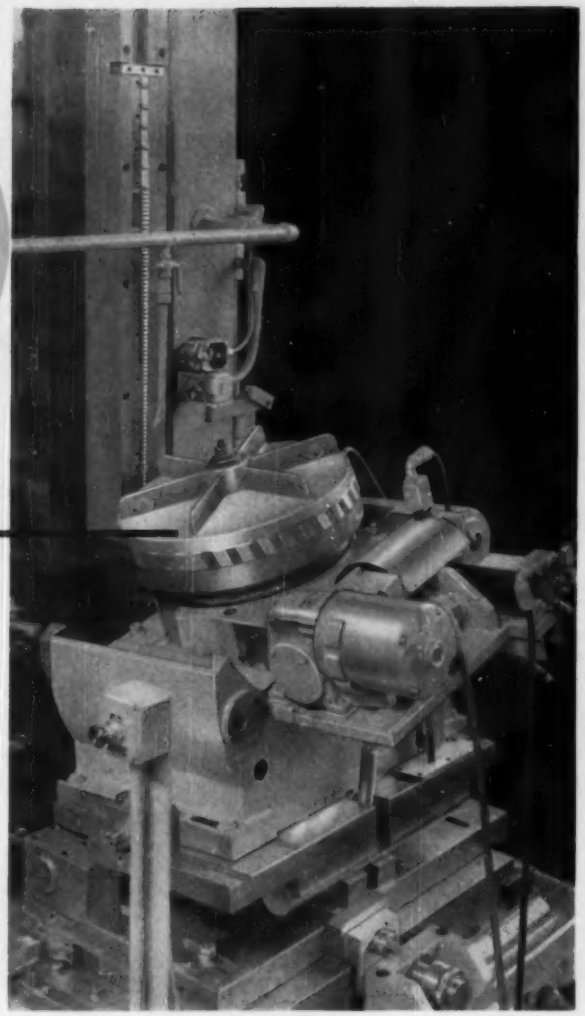
CH CONTINUOUS BROACHING, ELECTRIC



SRHE SINGLE RAM HORIZONTAL, ELECTRIC



without distortion!

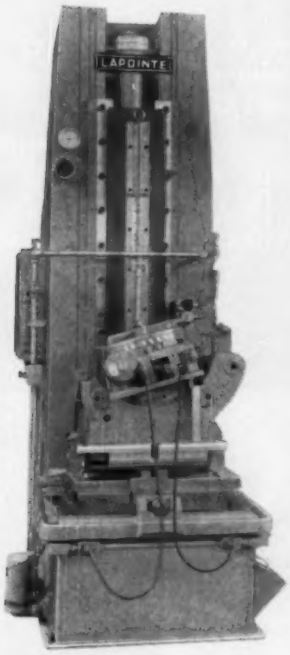


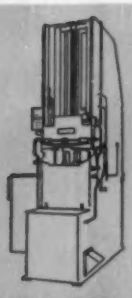
With this special Lapointe-built fixture, and using special tools, jet engine shrouds can be broached — *extremely fast* — to the close tolerances required on all jet engine components.

Fixture can be set for broaching at any compound angle between 0° and 15° conical, and 0° and 15° axial.

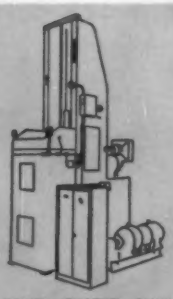
Indexing range is from 15 to 150 divisions.

(*At left*) Lapointe Single Ram Vertical Broaching Machine; 10-ton capacity 54-inch stroke.

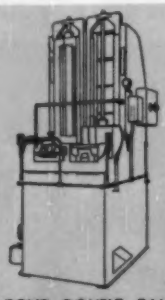




VUE-7 VERTICAL PULL-UP ELECTRIC



SRVE SINGLE RAM VERTICAL, ELECTRIC



DRVE DOUBLE RAM VERTICAL, ELECTRIC

LAPOINTE

known to be the best in

BROACHING

the latest word in low cost machining

televersal

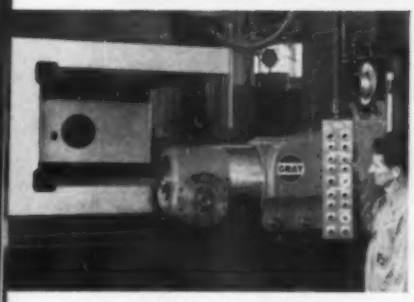
This new GRAY TELEVERSAL head tremendously increases machining range. Conveniently applied, quickly positioned, its great rigidity permits highest horsepower milling cuts.

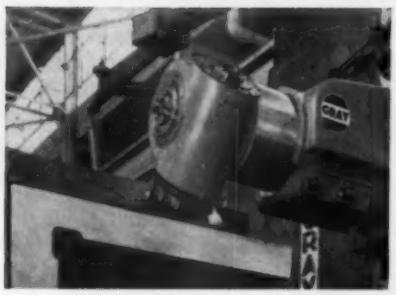
The large diameter quill may be swiveled to permit any angular cut. A triple-straddle clamp inflexibly locks the quill to the cast pyramid body.

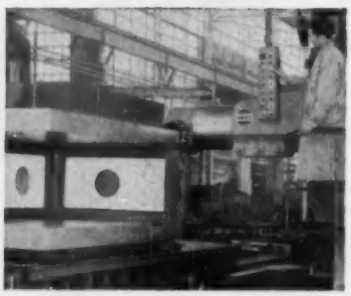
Designed to keep the job low and yet permit great machining range. Ideal when used with column cross travel of the new GRAY horizontal, boring, drilling and milling machine.

Not just an attachment, but a high power massively built, heavy milling unit that offers a new concept in versatility.

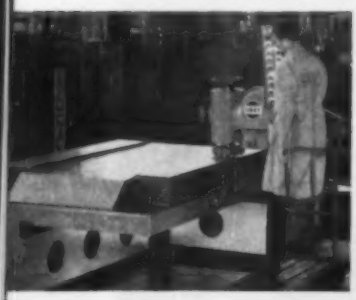
The G. A. GRAY Co., Cincinnati, Ohio

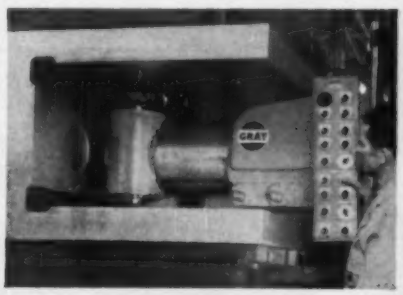


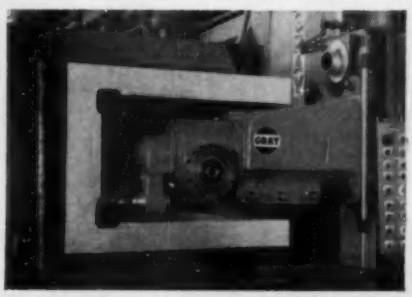


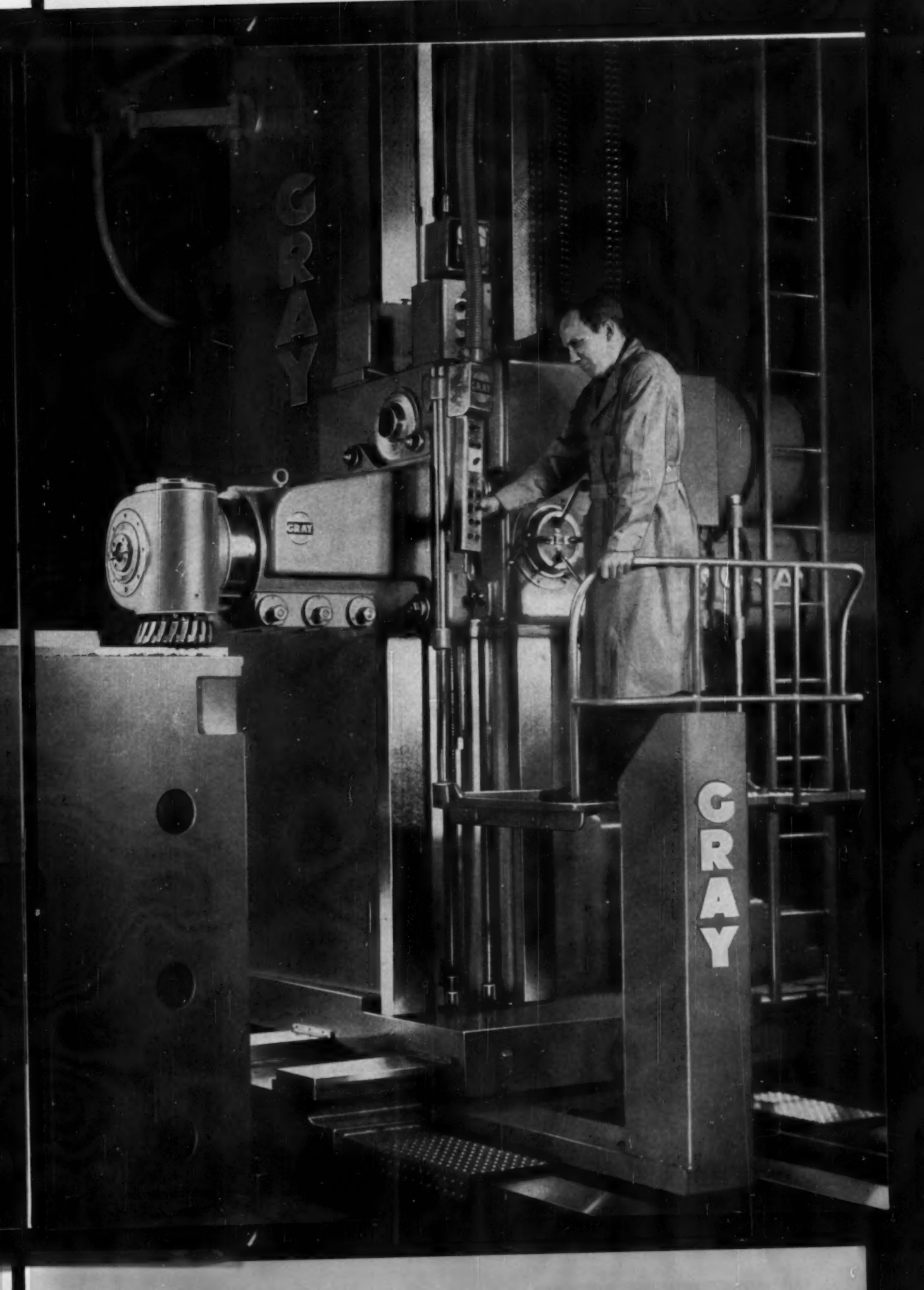


six different surfaces and more ... and only ONE work-setting

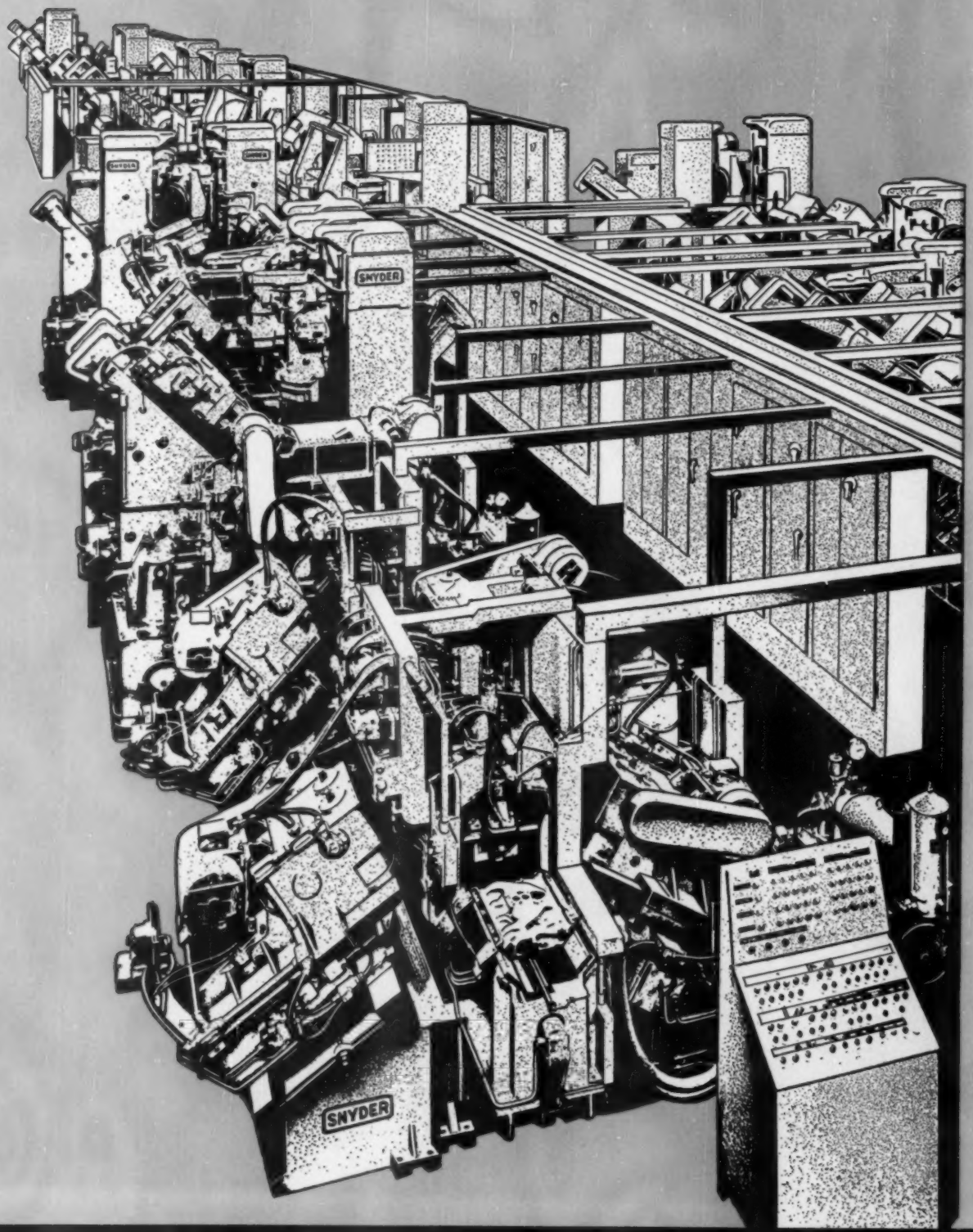







GRAY
GRAY
GRAY

Unique Combination of Snyder Special Two or Four Barrel Intake Manifold

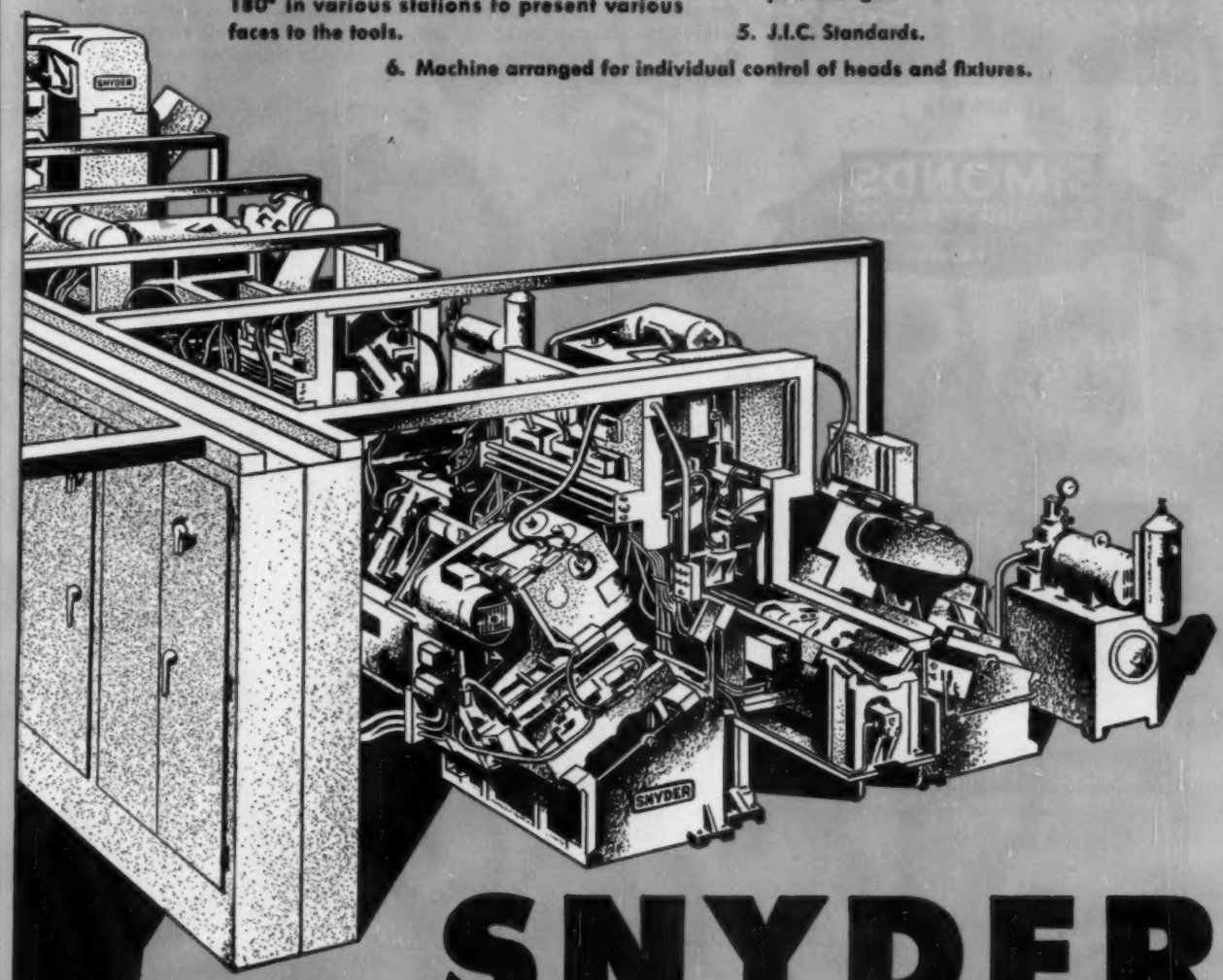


Transfer Machines Processes Either Castings from Rough to Finished Parts

Combination of two special transfer milling machines in parallel, with automation, feeding into one special transfer drilling machine gives production of 136 pieces per hour

Special Features of Snyder Machines Nos. 55-60 and 55-61

1. Machine line handles two or four barrel manifolds, random intermixed; sensing devices automatically instruct the proper drilling and tapping units.
2. Part rotated vertically 180° and horizontally 180° in various stations to present various faces to the tools.
3. Individual electrical panels and hydraulic units for each segment.
4. Wing bases, sections, spacers and risers standard throughout for easy adaptation to future part changes.
5. J.I.C. Standards.
6. Machine arranged for individual control of heads and fixtures.



SNYDER

TOOL & ENGINEERING COMPANY

3400 E. LAFAYETTE • DETROIT 7, MICHIGAN

32 Years of Special Machine Tools with Automation

SIMONDS SERVICE

the Extra Value behind Every

SIMONDS Segmental Saw!

Sure you get straighter cutting, smoother finish and greater satisfaction when you select Simonds Segmental Saws — with your choice of tongued or slotted segments. But you get a lot more!

You get fast, dependable service at Simonds Factory Branches from skilled Simonds servicemen who really know their business.

In Sharpening — Newest automatic sharpening machines operated by men who have an instinctive "feel" for the proper cutting edge combine to put "new life" in your favorite saws.

In Repairing — Specially designed equipment handles flattening, straightening, tensioning, riveting, and finish grinding.

In Re-segmenting — Specialists using the latest techniques and machines have the know-how to do any re-segmenting job quickly to your complete satisfaction.

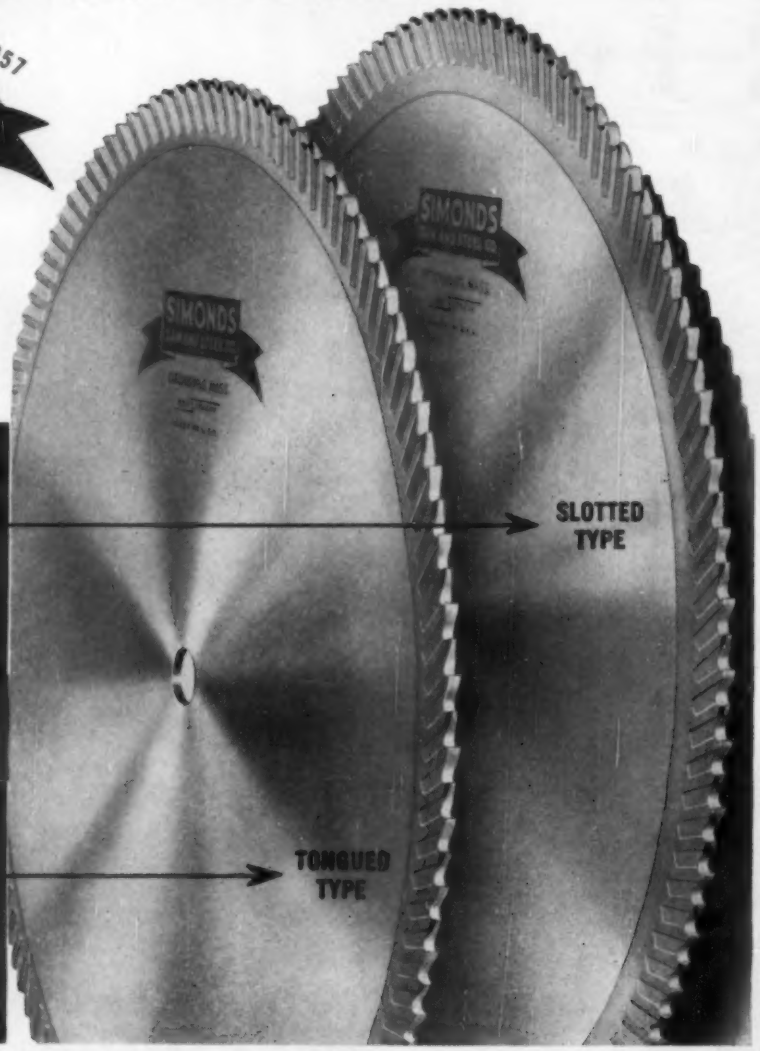
For complete Segmental Saw Service send your saws to any of these Simonds Factory Branches: 1350 Columbia Road, Boston, Mass. • 3323 West Addison St., Chicago, Ill. • 228 First St., San Francisco, Calif. • 6500 N.E. Halsey St., Portland, Oregon.

NOTE: Simonds Segmental Saws (either tongued or slotted type) are made of tough shock-resistant alloy steel saw plate with accurately fitted High Speed Steel toothed segments securely riveted to the rim. Saws are also available with carbide tipped segments for cutting aluminum and magnesium.

125 YEARS OF GROWTH • 1832-1957

SIMONDS
SAW AND STEEL CO.
FITCHBURG, MASS.

SIMONDS SERVICE INCLUDES
SHARPENING, RE-SEGMENTING AND REPAIRING
BOTH TYPES



Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon, Canadian Factory in Montreal, Que., Simonds Divisions: Simonds Steel Mill, Lockport, N. Y., Heller Tool Co., Newcomerstown, Ohio, Simonds Abrasive Co., Phila., Pa., and Arvida, Que., Canada

Soft water saves wives

N. J. Cornwall, Ass't Gen. Manager, Tanks, Inc., manufacturers of galvanized water softener tanks.

This man saves money making water softener tanks with Sciaky Resistance Welding Techniques

Among wives, Norm Cornwall would be rated a wife saver, but at Tanks, Inc., he's a money saver because his production is smooth and almost completely trouble-free. And his manufacturing costs are so low that customers such as SERV i SOFT can offer their water softener rental service at really competitive prices!

Why don't *you* get the facts on how Sciaky resistance welding techniques can simplify your metal parts assembly and lower your unit costs at the same time . . . just as Mr. Cornwall did!

SCIAKY

You can read the details of this application on the next page . . .

Resistance Welding Galvanized Steel

SCIAKY

HELPS PUT PROFIT INTO MANUFACTURING

The Economy of Seam Welding Galvanized Tanks in Limited Production

Questions frequently arise as to the practicality of resistance welding galvanized steel. However, Sciaky Resistance Welding Techniques have proved it can be done safely and economically.

The effect on zinc coating

In spot or projection welding the zinc coating remains intact when the correct Sciaky techniques are employed. In seam or flash-butt welding the zinc on the outer surfaces is removed. However, the corrosion resistance is easily restored by coating the surfaces with a priming paint such as aluminum in the way Tanks, Inc., does it. The efficiency of the Sciaky resistance welding process more than offsets the extra painting operation.

Seam welding galvanized tanks

In the Franklin Park, Illinois, plant of Tanks, Inc., Ass't Gen. Manager, Norm Cornwall, has developed a simple but efficient process for joining bottoms to shells in the manufacture of galvanized tanks.

A single operator, employing Sciaky resistance welding techniques, inserts the bottom in the shell, welds it, and restores the protective coating at a rate of 55 per hour.

The manufacturing sequence

Figure 1 shows the first operation in which the operator drives the bottom into the shell with a hammer. In actual practice he performs this operation and the third operation while welding is in progress.

FIG. 1 Operator inserting tank bottom into the shell.

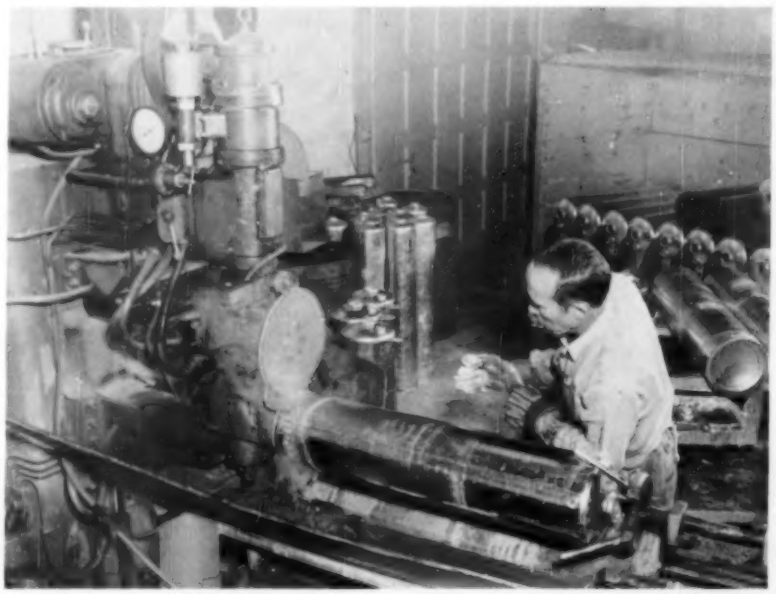


FIG. 2 Sciaky Seam Welder joins the bottom to the shell.

The second operation is the welding. The operator first makes a short (1") tack seam weld on the side of the shell opposite the longitudinal seam of the tank.

The tack welded assembly is then placed in the Sciaky welder and clamped in position by an air actuated fixture. The weld is started adjacent to the longitudinal seam of the shell and the operator helps it over this enlarged section. After this the welding proceeds unattended at a speed of 37.5" per minute with a spot spacing of 15 per inch. (See Figure 2). After completion of the full 360°, the operator allows the welder to continue and reweld over the longitudinal seam. This practice minimizes the danger of "leakers".

In the third operation the operator paints over the seam weld with aluminum paint to restore the corrosion resistance of the seam.

Information available

Case histories outlining the successful use of Sciaky Resistance Welding Techniques on galvanized material are available on request. An engineering report on resistance welding of galvanized steel is also available. Specific recommendations will be furnished on receipt of an outline of your requirements.

Write today, mentioning the information you would like to receive. There is no obligation. Sciaky Bros., Inc., 4932 W. 67th St., Chicago 38, Ill. POrtsmouth 7-5600.

DO YOU HAVE A RESEARCH PROBLEM?

Facilities of the Sciaky Research Division at Los Angeles, California, are available for contract research to answer resistance welding problems. Housed in a 15,000 sq. ft. building, these facilities include an experienced engineering staff, a complete range of the most advanced resistance welding machines including the largest in the world and a laboratory equipped for metallography, chemistry, electronics, photography and testing as applied to resistance welding. Write for further information and ask for the 20 page Research Division brochure.

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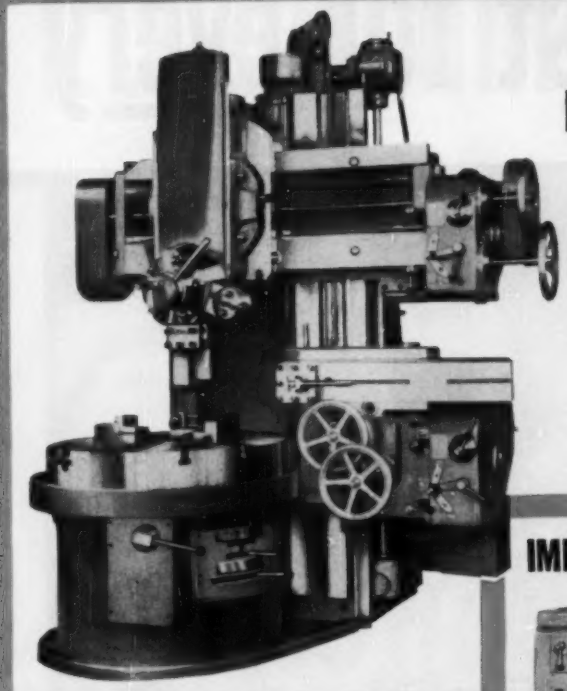

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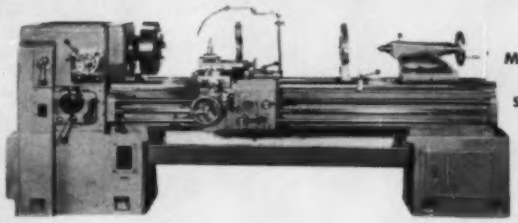

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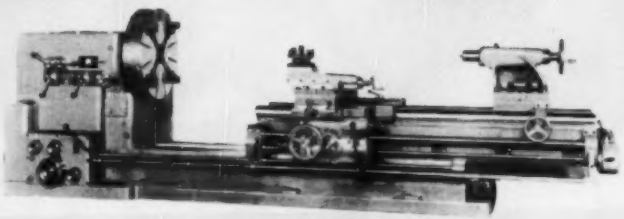

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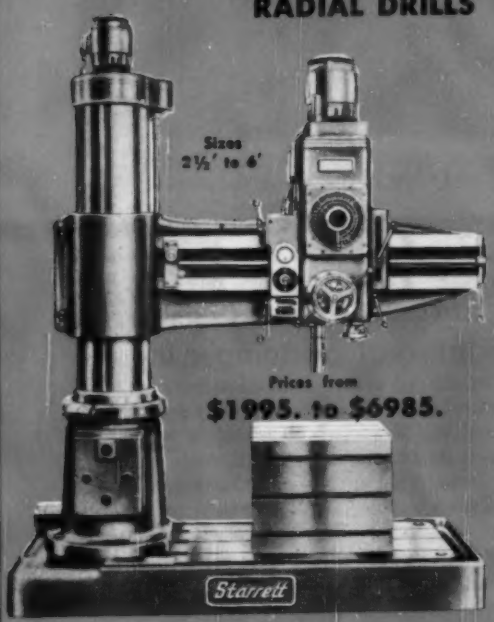

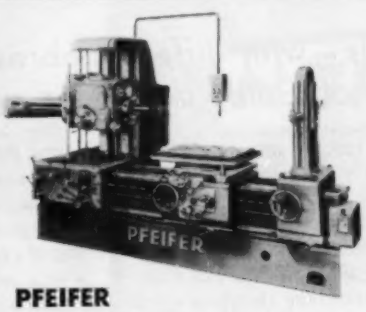

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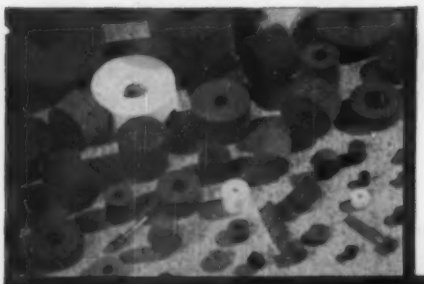

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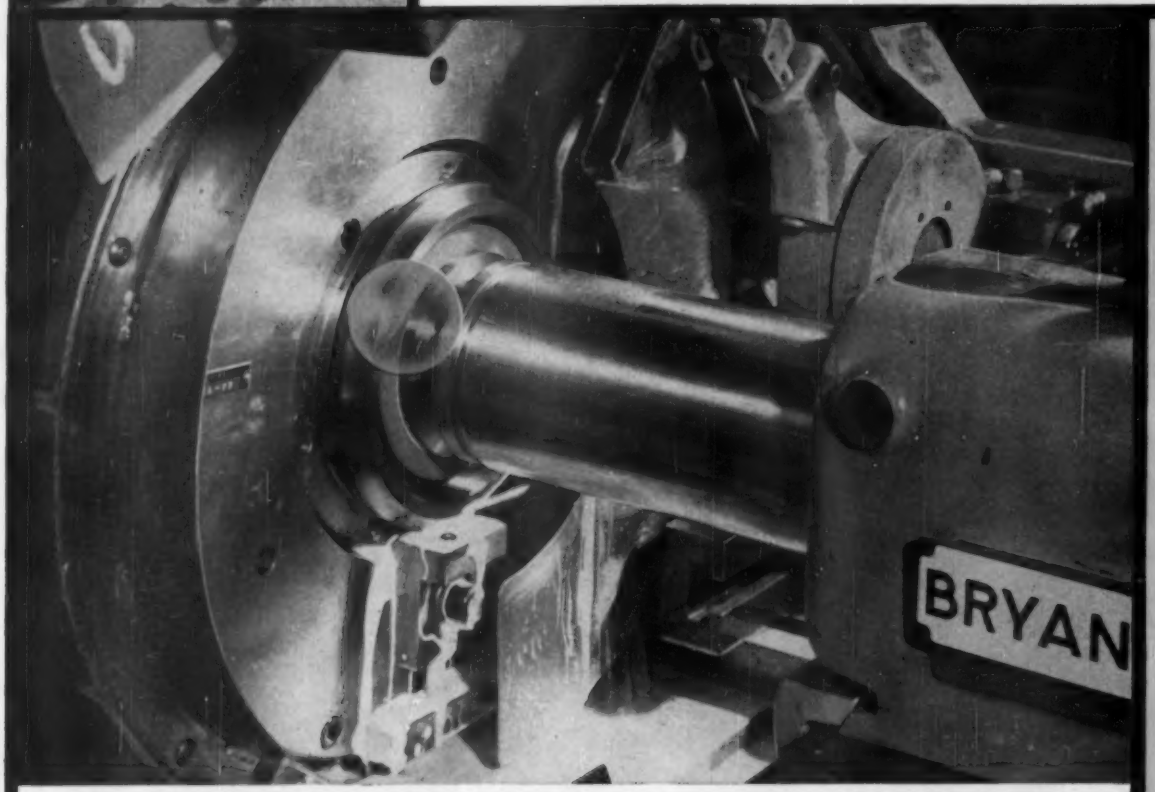

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A Pennsylvania customer, internal grinding steel gear housings, says "44's" are: *Freer cutting wheels that hold*

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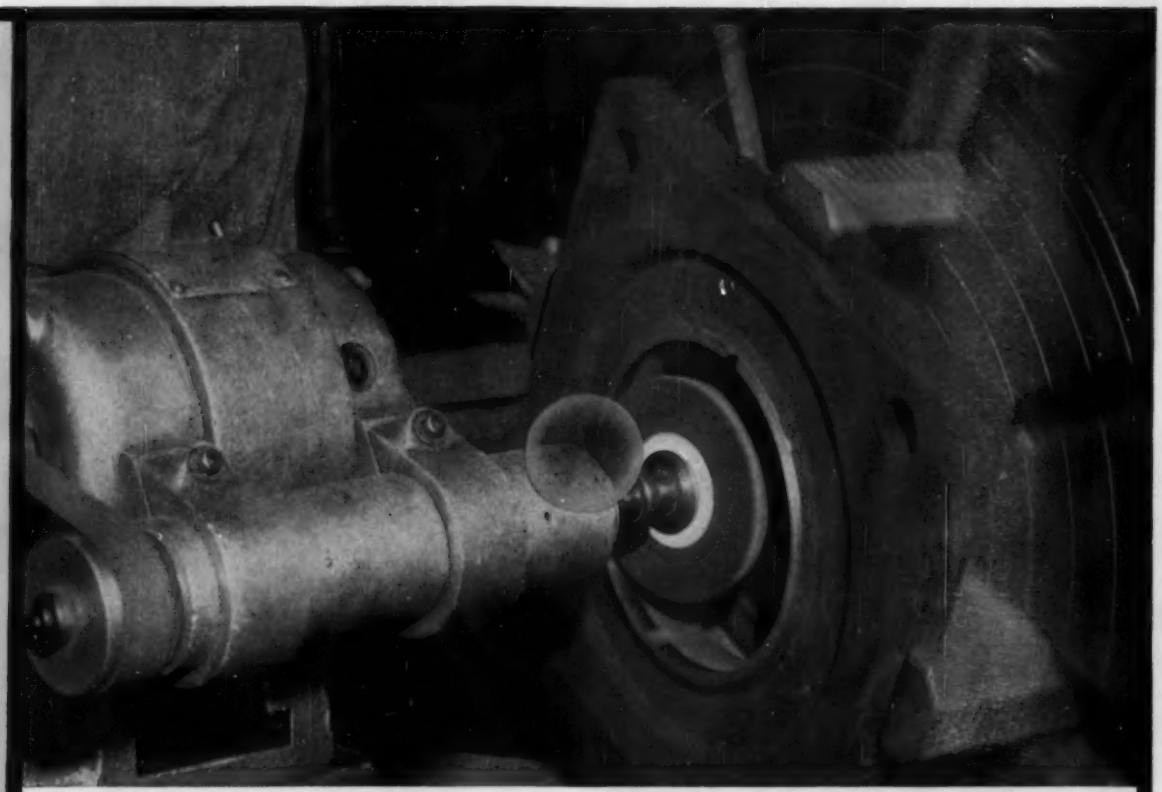

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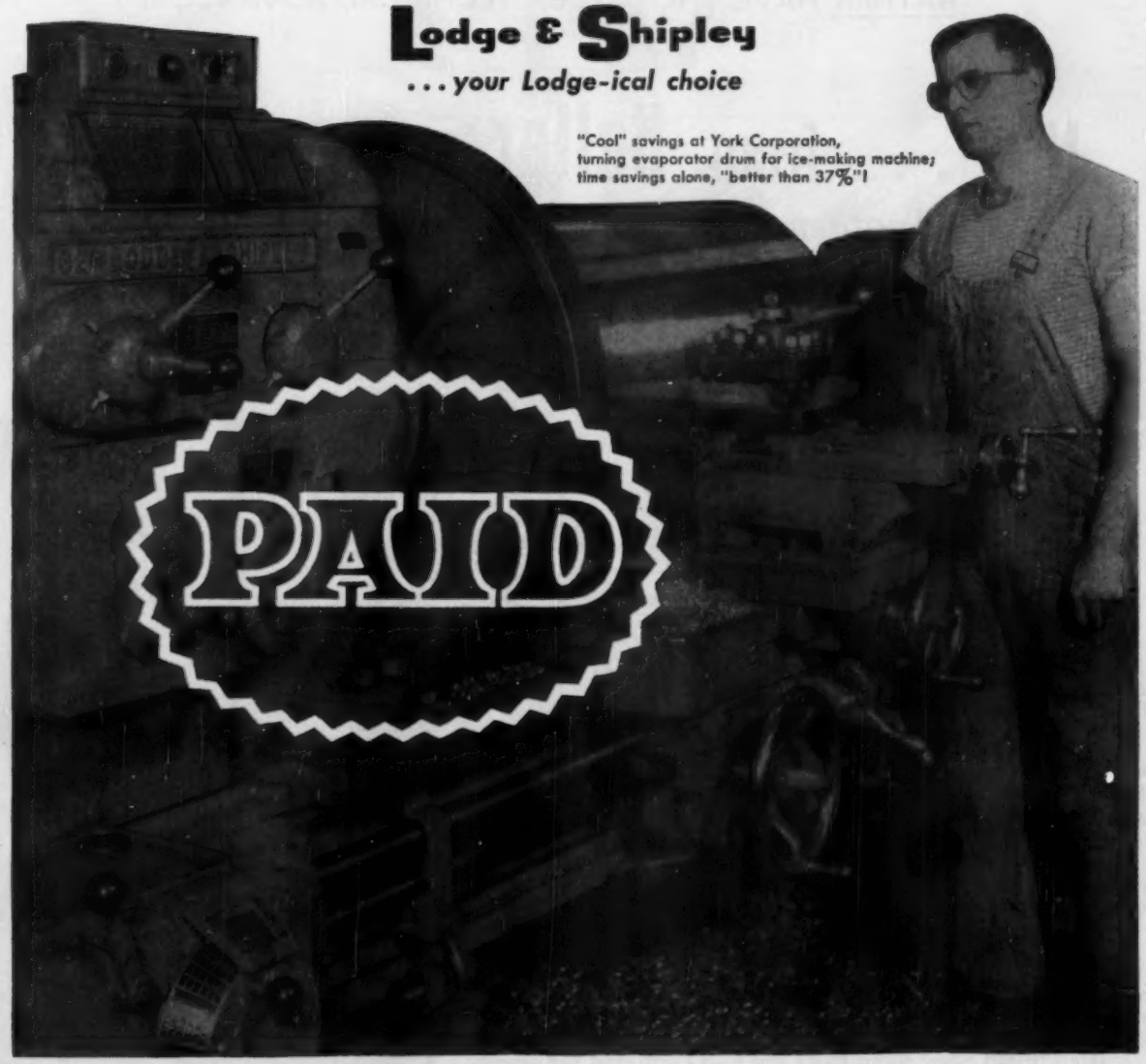
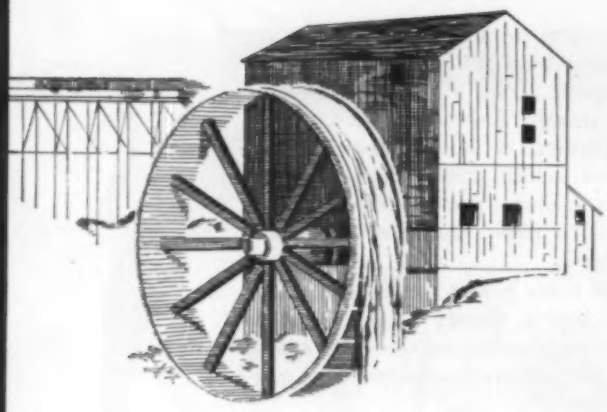


"Cool" savings at York Corporation, turning evaporator drum for ice-making machine; time savings alone, "better than 37%"!



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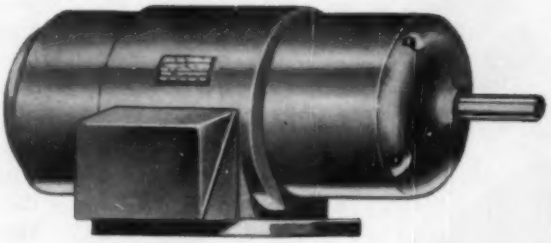

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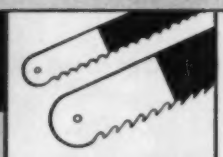

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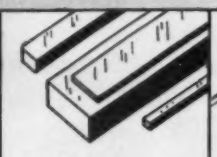

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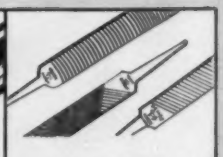

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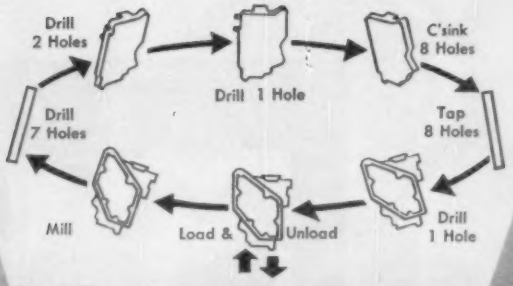

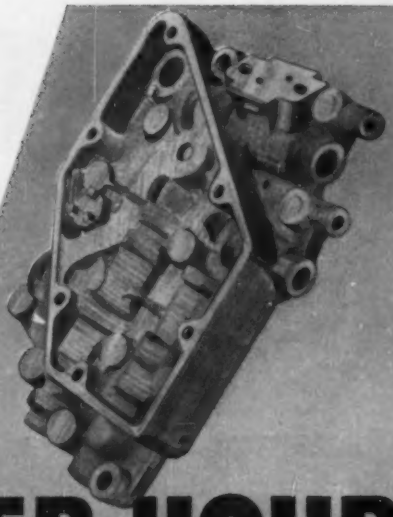

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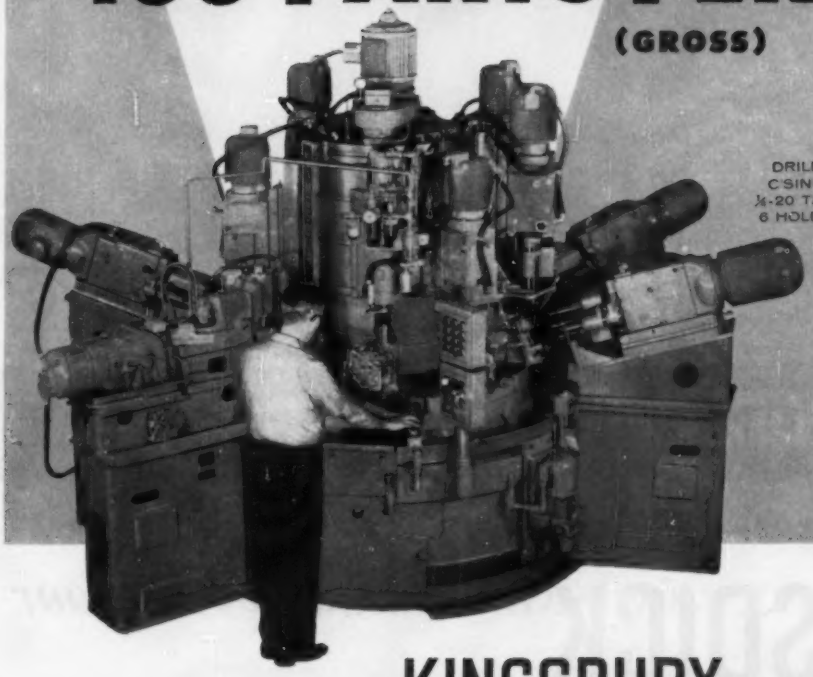

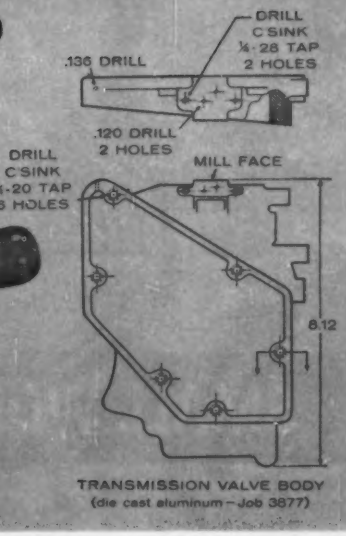

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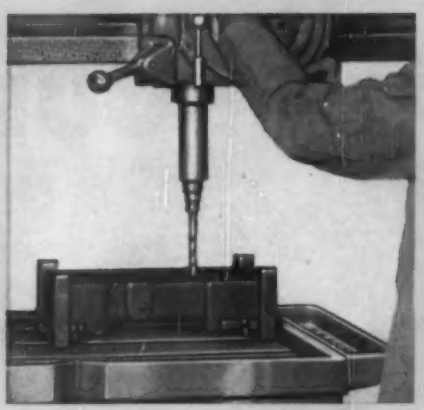

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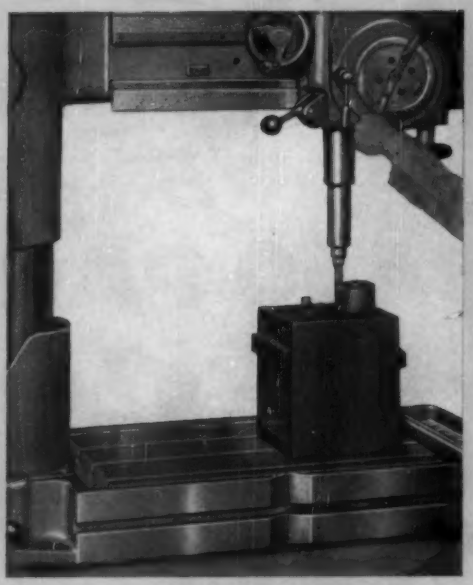

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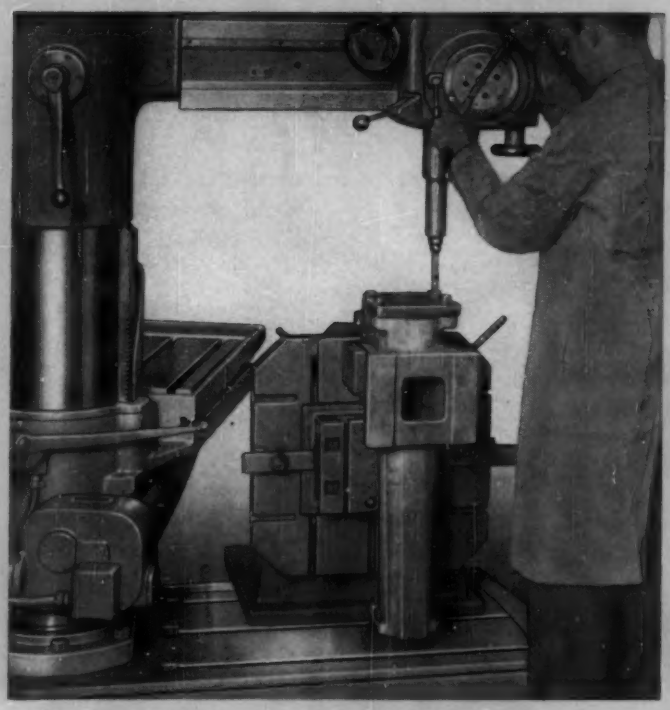

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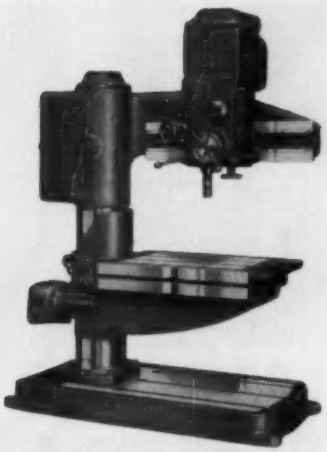

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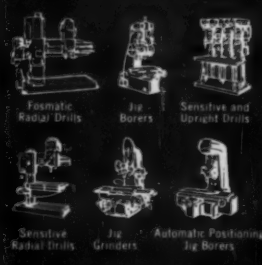
Write today for complete information on the Fosdick Sensitive Radial Drill.



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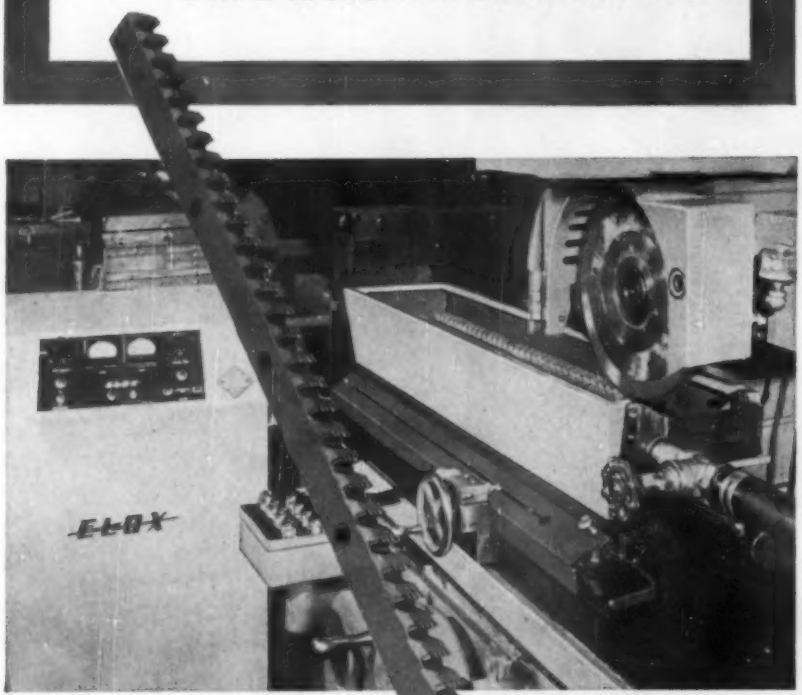

Savings on preformed carbide blanks	$ 32.00
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The Job...
Broach, used for broaching the pine tree form on turbine blades of the J-57 Jet engine.

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EDM substitutes inexpensive brass wheels costing less than $45 for expensive diamond wheels costing a minimum of $150. Brass wheels are formed for $1 as against a diamond wheel contour forming cost of $35.

NO PREFORMED CARBIDE BLANKS...
Conventional machining necessitates preformed tungsten carbide and preformed steel shanks. EDM machines the carbide, brazing material and steel simultaneously, and requires no indexing to assure a perfectly formed broach as to location and size.

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Conventionally machined, the pine tree broach requires 22 operations. EDM does it better in 14.

Electrical Discharge Machining has reduced the machining time of this intricate form in 32 carbide tipped teeth to a total time cycle of 33 minutes . . . one-half the time of abrasive grinding. Tolerances held to: +0, —.0002".

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EDM keeps you ahead of competition ○ Grinding ● Die Sinking ○ Form Grinding ○ Single Point and Insert Tool Sharpening

Precision parts made at Cramer Controls Corporation are used in washing machines, dryers, and in the electronics field. Here, B. F. Kimball, Gulf Sales Engineer, checks fine machined finish of such parts with Wallace Perzanoski, Foreman. The cutting oil: Gulfcut 31A.

Closer tolerances, longer tool life with GULFCUT!

Cramer Controls Corporation, Ballouville, Connecticut, makes precision parts for Cramer synchronous motors and electrical timing devices. For the past 2 years this plant has used Gulfcut 31A in its battery of Browne & Sharpe automatic screw machines . . . with excellent results.

"Gulfcut 31A," according to Wallace Perzanoski, Foreman of the automatic screw machines, "gives us excellent tool life—which of course has helped us boost production—and helps us hold to closer tolerances."

Other users of Gulfcut 31A cite such benefits as reduction in number of rejects, finer finishes, and lower machining costs.

The complete Gulfcut line includes many different types of cutting oils to meet every metal cutting need. Selection of the proper cutting oil can help you improve operations, increase tool life, cut overall costs. Contact your nearest Gulf office and ask a Gulf Sales Engineer to call.

GULF OIL CORPORATION
1822 Gulf Building
Pittsburgh 30, Pa.

GULF

THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS

If WEAR is a factor...

...use

VK CARBIDE PLUG GAGES

TUNGSTEN CARBIDE
wire type .010" to .760" diameter*

TUNGSTEN CARBIDE
taper lock type .365" to 1.510" diameter

In addition to its regular line of tungsten carbide wire type plug gages from .010" to .760" diameter, The Van Keuren Co. now offers a line of tungsten carbide taper lock plug gages in the range from .365" to 1.510" diameter.

Van Keuren tungsten carbide wire type gages have proved their worth on thousands of tough gaging jobs. VK tungsten carbide taper lock gages are similarly effective. If wear is a factor in your overall gage costs, you can save money by using VK carbide plug gages.

Finish on VK gages in either the wire type or taper lock type in tungsten carbide will average .5 RMS or better.

These gages are available in Class Y, X, XX and XXX accuracies at moderate prices and on a reasonable delivery basis.

*Note full length wire-type member in above illustration.

Send for a copy of the new, 258-page Van Keuren Catalog and Handbook No. 36 containing valuable technical and engineering information on measuring problems and methods. Address:

VK

38th YEAR

THE Van Keuren CO.,

173 WALTHAM STREET, WATERTOWN, MASS.

Optical Flats . . . Light Wave Equipment . . . Light Wave Micrometers . . . Gage Blocks . . . Wire Type, Taperlock and Trilock Plug Gages . . . Master Setting Disks . . . Thread Measuring Wires . . . Gear Measuring Wires . . . Carbide Plug Gages . . . Carbide Pivots . . . Precision Lapping Service.

Mister, you're looking at a panelboard that's really built for Heavy Duty!

The heart of this QMB Saflex Distribution Panelboard is the quick-make, quick-break, horsepower rated switch unit.

It's loaded with features—

- Each switch unit individually enclosed in heavy gauge steel
- Dead front construction
- Heavy duty cast operating handle
- Double-spring mechanism insures positive opening under full load
- Visible blades for maximum safety
- Positive pressure fuse clips and switch jaws assure maintenance-free connections
- Cover interlock prevents unauthorized access but makes normal maintenance easier

QMB Saflex Distribution Panelboard

Here's a panelboard that's built for the tough jobs! But it goes a lot further than rugged construction. It's designed with plenty of space for easier wiring and maintenance.

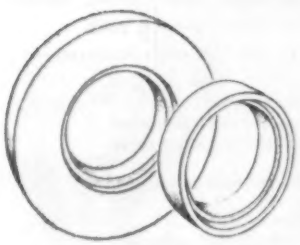
Write for...

Bulletin S D-29 for further information
Address: Square D Company,
6060 Rivard Street,
Detroit 11, Michigan

NOW...EC&M PRODUCTS ARE A PART OF THE SQUARE D LINE!

SQUARE D COMPANY

Jim Lewis, of W. Lewis Sales Co., Cleveland, typical Bay State distributor, says," I try to figure out how I'd meet my customers' payrolls and still make a profit. That way I get ideas I'd never have if I just concentrated on my own selling problems."



The "hole" on the right is all they throw away now.

He put one wheel to work on two machines!

Ed and John Menhart, co-owners of Cleveland's Micro-Plane, Inc., were well satisfied with the 24" x 4" x 12" Bay State wheels on their big Hanchett horizontal surface grinder. They were the only wheels they'd found in 8 years that could handle the tremendous variety of work that went through their shop.

But . . . because surface speed dwindled as the wheels wore down, grinding efficiency naturally dropped, too. This bothered Jim Lewis, the Bay State distributor who specified the wheels, because he hates to see his customers throw away "anything but the hole" in a grinding wheel.

Lewis got together with the people in Bay State's Cleveland office and figured out a solution. At their suggestion, Micro-Plane adapted a smaller Hill-Acme surface grinder that not only put the half-used wheels efficiently and profitably to work but also substantially reduced wheel costs because they no longer had to buy wheels for the Hill-Acme.

If you would like to supplement your engineering staff with an abrasive specialist like Jim Lewis, you'll find it well worth your while to talk to the Bay State man in your area. He's trained to find *practical, profitable* solutions to your grinding problems.

BAY STATE WHEELS of PROGRESS

BAY STATE ABRASIVES

Bay State Abrasive Products Co., Westboro, Massachusetts.
Branch Offices and Warehouses: Bristol, Conn., Chicago, Cleveland, Detroit, Pittsburgh. *Distributors:* All principal cities. Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ontario.

. . . all automatically handled by

BULLARD

MULT-AU-MATIC TYPE "L"

Transferred to and from the machine by roller conveyors, rough piece is loaded, completely machined and finished part is unloaded without any manual effort. The machining operations performed at seven stations include boring and counterboring, rough and finished facing, rough and finished turning, drilling and chamfering — eighteen separate operations in all.

"We went to Bullard on this job" according to the Master Mechanic of a leading manufacturer of automotive clutches, "because our program definitely called for a multiple spindle machine and the Bullard Mult-Au-Matic, Type "L" was best suited for the operation. Actually, its greater number of stations, larger spindles and greater power made it the only multiple spindle machine which fitted the job."

Remember . . . to cut cost when cutting metal — buy **BULLARD**

FOR COMPLETE
INFORMATION CALL YOUR
NEAREST SALES ENGINEER
OR SEND FOR CATALOG TODAY.

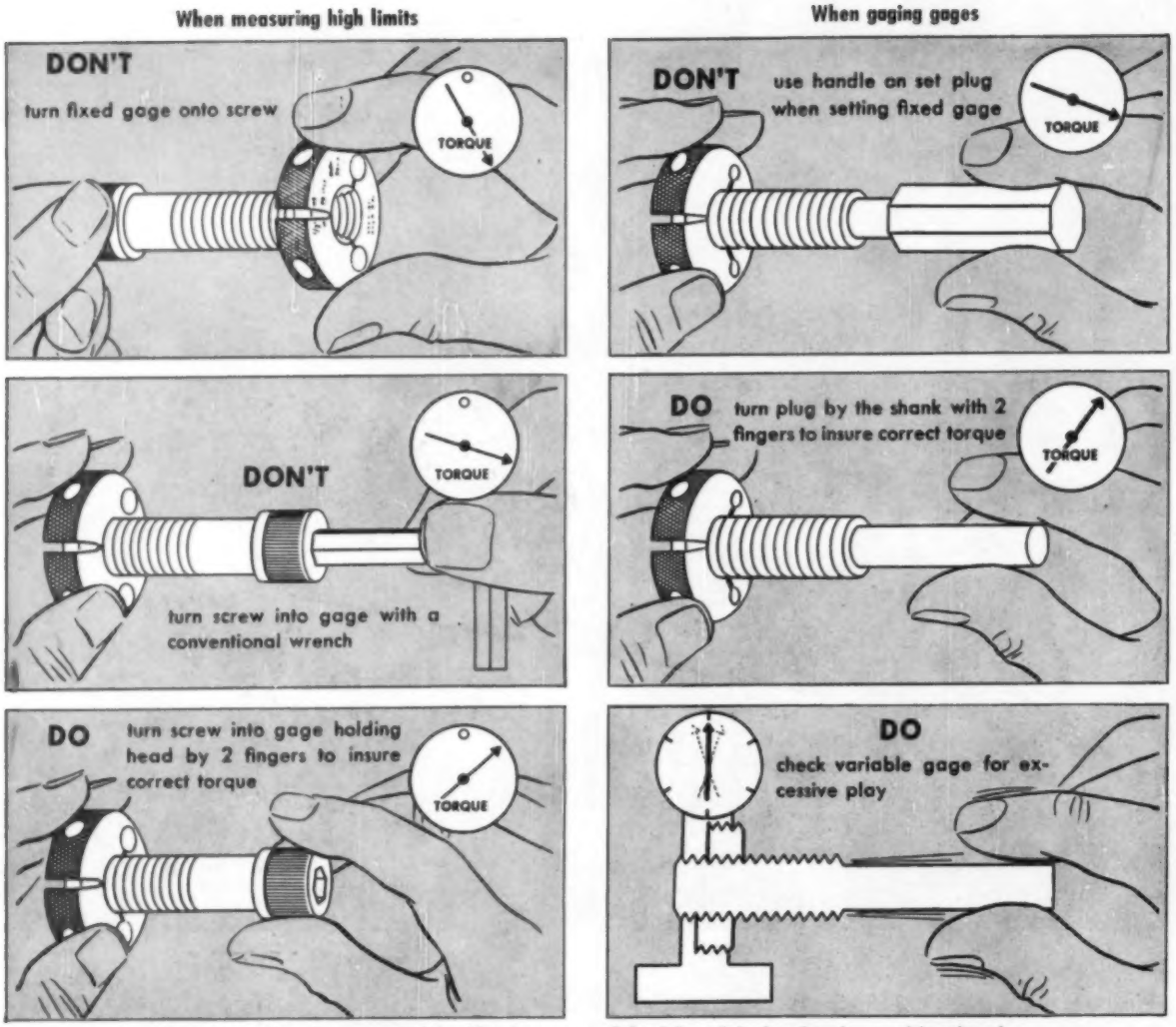
THE BULLARD COMPANY
286 CANFIELD AVENUE • BRIDGEPORT 9, CONN.
Please send me a copy of the NEW MULT-AU-MATIC, TYPE "L" CATALOG

Name_____

Company_____ Position_____

Address_____

City_____ Zone_____ State_____



These illustrations from new SPS booklet show some of the do's and don'ts of gaging precision threads.

3A threads: what they are; how to gage them — new SPS booklet tells all

Threads made to Class 3A fit are the most precise in general use in industry. But you do not always get the 3A precision you specify. Because of many different gaging techniques that yield varying results, screws with threads well outside the Class 3A tolerance limits often pass inspection.

SPS has prepared a new booklet on this subject. It explains clearly what Class 3A threads are and the pros and cons involved in the widely varying gaging techniques in use today. It reviews the gaging of high and low limits of 3A threads, sampling techniques, and even the methods of gaging gages.

All standard UNBRAKO socket screw products fall within specified tolerance limits *no matter what method is used to gage them.* Leading industrial distributors carry complete stocks. Unbrako Socket Screw Division, STANDARD PRESSED STEEL Co., Jenkintown 1, Pa.

We also manufacture precision titanium fasteners. Write for free booklet.

Form 2239, "Class 3A Threads: what they are; how to gage them." 16 pages, with many illustrations. Write for free copy today.

STANDARD PRESSED STEEL CO.

UNBRAKO SOCKET SCREW DIVISION SPS

JENKINTOWN PENNSYLVANIA

Feeling M-i-g-h-t-y Low?

IF GRINDING WHEEL PROBLEMS HAVE YOU DOWN IN THE DUMPS, DON'T MONKEY AROUND. Switch to CINCINNATI (PD)° WHEELS. For *now* CINCINNATI Grinding Wheels offer POSITIVE DUPLICATION—a remarkable achievement in precision manufacturing and quality control that *can save you money . . . and increase your production.*

You'll start every day with a big smile and a spring in your step when CINCINNATI (PD) WHEELS are on the job. For through the CINCINNATI (PD) Manufacturing Process you are assured Positive Duplication of the original wheel *every* time you reorder. "On grade" with a CINCINNATI (PD) WHEEL means all future (PD) WHEELS will act and grind exactly alike.

Yet CINCINNATI (PD) WHEELS *are priced no higher than ordinary wheels.*

So, let us help you see the bright side of life once more. Just contact us and we'll send one of our representatives—men who know grinding and grinding machines as well as grinding wheels. Write, wire or telephone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio. Remember—*only* CINCINNATI Grinding Wheels give you . . .

(PD) POSITIVE DUPLICATION

CINCINNATI
Grinding Wheels

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

°Trade Mark Reg. U. S. Pat. Off.

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from Niagara comes...

- **A** **POWER OPERATED BARREL TYPE SLIDE ADJUSTMENT** facilitates and speeds die-setting. Push button operated, it's not only fast and smooth but permits micro-positioning within a thousandth of an inch.
- **B** **HYDRAULIC INCLINING DEVICE** operates smoothly. The press can be inclined or brought upright in approximately 2 minutes. Operating lever and push buttons conveniently located on left panel leg.
- **C** **BRAIN CENTER OF THE AUTOMATION SYSTEM,** the Rotary Limit Switch can be adjusted precisely while the press is in motion for synchronizing automation devices with press cycle.
- **D** **LOW INERTIA, ELECTRO-PNEUMATIC FRICTION CLUTCH** operates directly on the crankshaft. Most of its weight continues to rotate with the main gear. Only the crankshaft and driving plate are started and stopped at each cycle. Heat and wear are reduced to an absolute minimum. Torque capacity may be changed by adjusting air pressure.

truly revolutionary line of OBI's

automated to hit new production highs

Never before has there been an OBI like this. In feature after feature, you'll see pulse-quickening newness that will inject speed and rhythm into your production. Outfitted with today's most advanced controls and devices, this all-new Niagara Series EA offers you automation at its very best.

Boasting a revolutionary front-to-back crankshaft design, it's streamlined in an ultra-modern, functionally sound, eye-pleasing way. In fact, it's the only totally-enclosed OBI ever made. There are no exposed, overhanging gears, flywheel or other mechanisms. With the entire driving assembly fully enclosed within the limits of the compact frame, this trim-line performer actually takes up less floor space than any press in its range and category. It's only natural that such a triumphant line of OBI's as this should parade from Niagara . . . for Niagara has been leading the way, *all of the way,* in building all types of OBI's — single crank and double crank, standard and fully automatic. Hailed as "the latest and greatest of them all," the Series EA is built in 4 sizes, with shaft diameters from 4½ to 7½ inches and capacities from 75 to 200 tons.

FULL DETAILS ARE YOURS FOR THE ASKING:
Write for illustrated Bulletin 56 today!

NIAGARA MACHINE & TOOL WORKS, BUFFALO 11, N. Y.

DISTRICT OFFICES

Boston • Buffalo • Cleveland • Detroit • Indianapolis • New York • Philadelphia

Distributors in principal U. S. cities and major foreign countries

- **E** **AIR CONTROL PANEL AND HYDRAULIC INCLINING SYSTEM** are neatly housed within the left leg. Air line filter, pressure regulator, gages, blow-off valves and lubricators, as well as the hydraulic pump for the inclining system, are all concealed behind a dust-tight door.
- **F** **AUTOMATIC CIRCULATING OIL SYSTEM** (left panel leg) sends metered flow of clean, filtered oil to all bearings and gears in the crown, air counterbalance and slide gibs. Correct operating oil pressure is maintained or the press stops automatically.
- **G** **CONTROLLED AIR SUPPLY AND PNEUMATIC TIMING RELAYS** (left panel leg): Air line receptacles, synchronized with press cycle, are provided for die doper, die kicker and die lifter . . . with auxiliary receptacles for die maintenance tools. Adjustable timing relays control interval of automation functions initiated by rotary limit switch.
- **H** **OPERATOR'S PANEL** (right panel leg) features deluxe operating controls conveniently arranged for fingertip direction of every press motion. Chained to safety block, safety plug de-energizes entire press control when pulled from its receptacle.
- **I** **COMBINATION MOTOR AND PRESS CONTROL PANEL** fully enclosed within the right leg behind a flush-mounted, dust-and-oil-tight door, houses: disconnect switches, circuit protection, transformers, fuses for main motor and auxiliary power supply; control relays; starters for main motor, lubrication and hydraulic pumps.

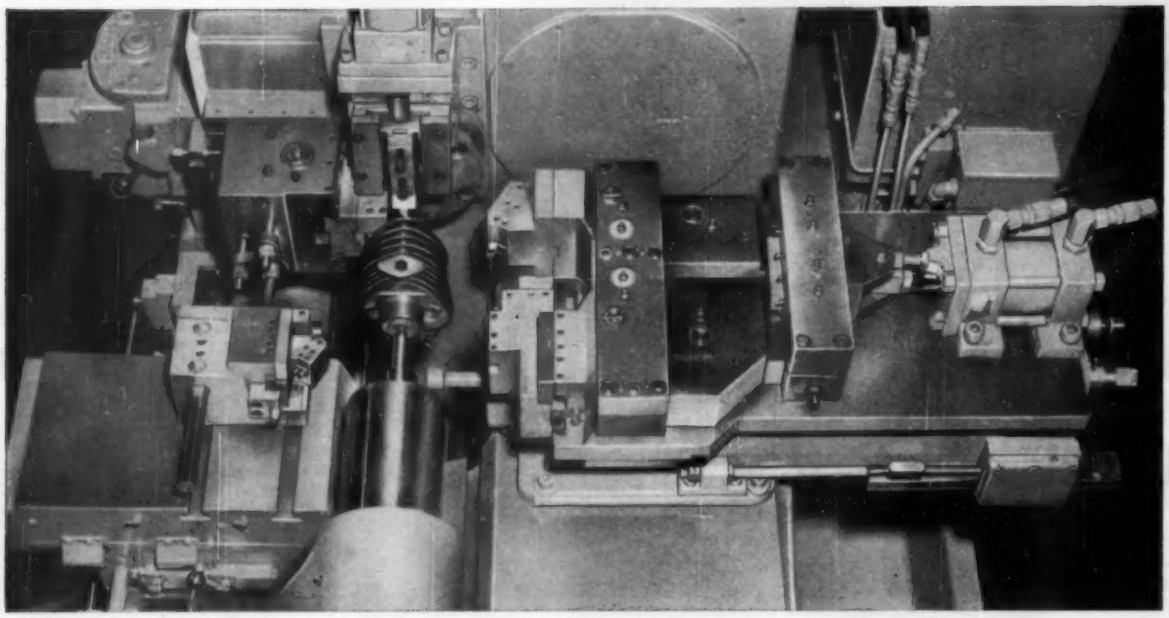
PNEUMATIC CUSHION is automatically lubricated by self-contained pumping system; internally guided and rigidly supported by press frame.

NIAGARA

front-to-back crankshaft AUTOMATED INCLINABLES

America's most complete line of presses, press brakes, shears, other machines and tools for plate and sheet metal work

Six different sizes and types of workpieces are handled easily on this job. Extra expanding mandrel and sleeves at right are for different sizes.



How Harley-Davidson speeds motorcycle part production

Machines both ends in single chucking, using Gisholt No. 12 Automatic to get maximum accuracy, cut production costs

This well-planned setup reveals how Harley-Davidson Motor Co., Milwaukee, Wis., is handling cast iron front and rear cylinders.

Smart tooling on a Gisholt MASTERLINE No. 12 Automatic Production Lathe handles 6 different sizes and types of workpieces. Change-over is fast and easy. A special headstock-mounted, air-operated locating stop speeds work handling.

While tools in the front carriage turn and chamfer at one end of the piece, tools in a headstock-mounted auxiliary slide chamfer the I.D. on the other side. Simultaneously, tools on the rear slide face both ends for length. At the end of the cut, tool blocks on the rear independent slide swing open automatically to provide tool relief before withdrawal. Floor-to-floor time on the part shown is 1.2 minutes, only 1.8 to 3.6 minutes for the other 5 workpiece types and sizes.

The new Gisholt MASTERLINE No. 12 Automatic Production Lathe is designed specifically for high production operations; yet, it is flexible enough to handle a variety of similar parts in small repeat lots. The automatic cycle frees the operator to handle other machines or do other work.

Make a note to phone your Gisholt Representative today. Ask him to come in and show you where the fast automatic cycle and flexibility of the No. 12 Automatic Production Lathe can cut your floor-to-floor time and reduce your costs.

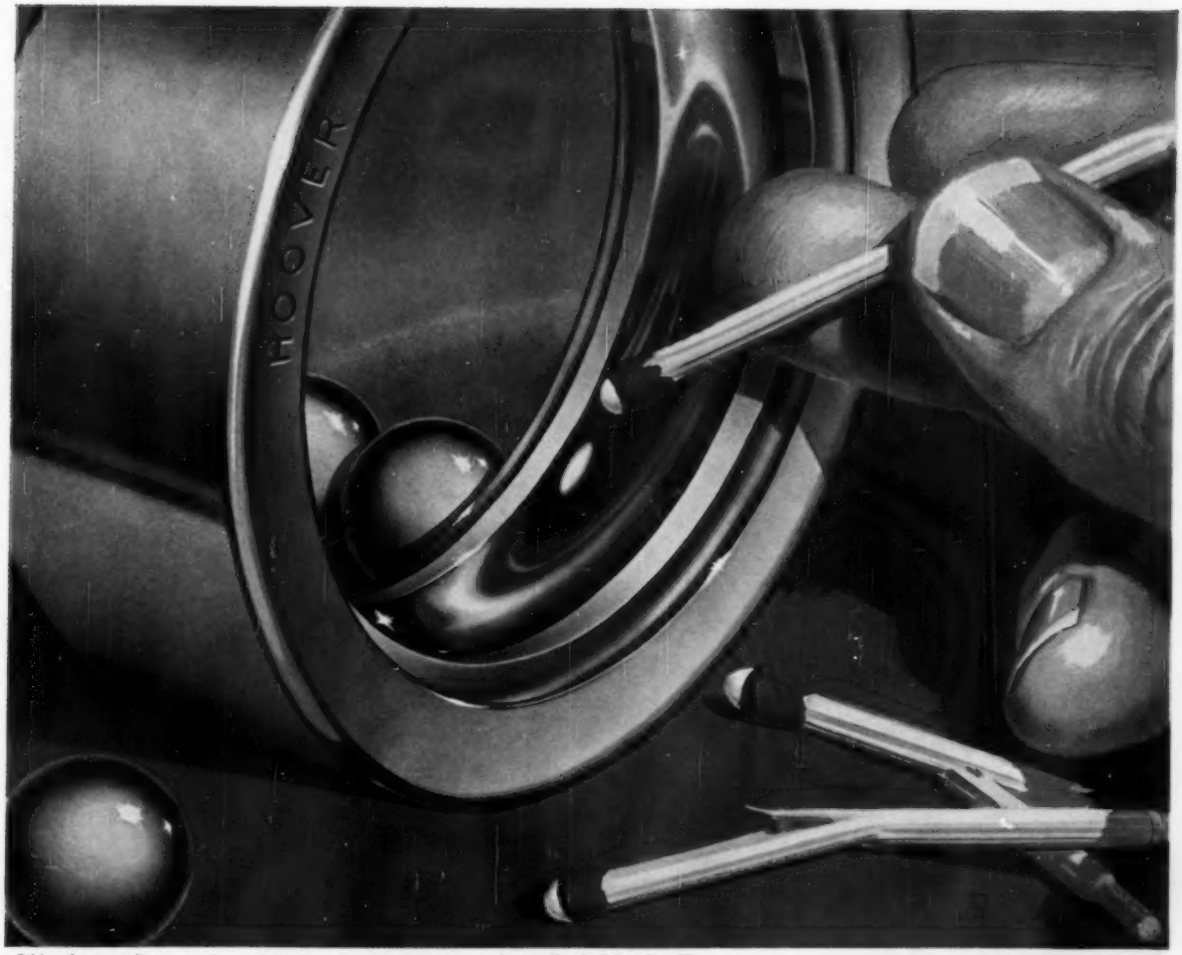
MASTERLINE GISHOLT SINCE 1887 GISHOLT

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin, U.S.A.

WRITE GISHOLT TODAY for advance data on the new Gisholt MASTERLINE No. 12 Automatic Production Lathe. Ask for Form 1178.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • PACKAGING MACHINES • MOLDED FIBERGLAS PLASTICS



It's easier to strike a match on plate glass than on the raceway of a quality ball bearing. The raceway's smoothness makes it virtually impossible. Even so, not all bearing raceways are equally smooth.

Hoover Honed Raceways are super smooth . . . superbly finished

Bearing life—load capacity—quietness. These and other factors in ball bearing performance depend largely on the smoothness and finish of the bearing's raceway.

And that's where *Hoover Honed* Raceways pay off . . . in extra smoothness and finish. All makes of bearing raceways are ground. But Hoover Raceways are also *fully honed*. Hoover Honing, a patented process developed by Hoover, is the last word in precision finishing for raceways.

Coupled with *Hoover Honed* Raceways are matched sets of Hoover *Micro-Velvet* Lapped Balls, made to unusually high standards of smoothness and roundness. Precision throughout the working surfaces achieves superior ball bearing quality . . . assures long life and unexcelled performance.

Investigate Hoover's line of ball bearings in the light, medium and heavy series, available in a variety of types. Hoover engineers are ready to assist manufacturers with engineering and design information. Write Hoover about your problem.

hoover

BALL AND BEARING COMPANY, ANN ARBOR, MICHIGAN

Hoover Honed and *Micro-Velvet* are Hoover Trademarks.

HOOVER HINTS:

Common Causes Of Bearing Failure

What makes an anti-friction bearing stop doing its assigned job? Improper lubrication, foreign bodies, soft balls or raceways, poor race concentricity, high operating temperatures and incorrect bearing selection—all are possible causes for premature bearing failure.

Common causes of bearing failure is but one of the many problems confronting users of anti-friction bearings—this problem as well as others pertaining to bearings are given concise coverage in the Hoover Handi-Book of Anti-Friction Bearings. Write for your copy today . . . it's written to help you select the right bearing for any application.

Hoover Ball and Bearing Company,
Ann Arbor, Michigan.

Mail my copy of "Hoover Handi-Book of Anti-Friction Bearings."

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Title_____

Company_____

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11

ARMSTRONG

T-SLOT CLAMP

STEP BLOCK

SET-UP AND HOLD-DOWN TOOLS

ARMSTRONG Set-up and Hold-down Tools reduce setting-up time—keep men and machines producing. Designed for use on planers, drill presses, milling machines, etc., they hold work securely and rigidly, and thereby reduce spoilage and prevent costly accidents.

Your local Armstrong Distributor carries ARMSTRONG Set-up and Hold-down Tools in stock in sizes for every operation. Stop haphazard setting-up methods. Provide each of your machines with a full complement of ARMSTRONG Set-up and Hold-down Tools.

NON-SKID BLOCK

Write for Circular

Buy ARMSTRONG TOOLS from your Industrial Distributor

PLANER JACKS

UNIVERSAL CLAMP

T-SLOT BOLTS AND NUTS

STRAP CLAMPS

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5215 W. ARMSTRONG AVE. CHICAGO 30, U. S. A.

Cut intricate shapes of sintered carbides and super alloys with Method X.

Ex-Cell-O Method X Standard Vertical Electro-spark Machine.

Electrospark machining really cuts costs

57-39

Doubt it? Here's what you can do. With an Ex-Cell-O Method X Machine, sintered carbides and super alloys can be quickly and easily cut off, pierced, slotted, formed, trepanned, drilled and tapped, often in shapes (above) no other machine tool can duplicate.

What's more, because Method X can readily machine toughest metals, many shops find it pays for itself as a scrap-saver alone. With Method X, other machines' mistakes can be corrected, even *after* hardening.

Why not check today on the very real cost-cutting opportunities Method X may offer in your own manufacturing operation? Simply contact Ex-Cell-O, Detroit.

EX-CELL-O CORPORATION — *Machinery Division*

DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • TORQUE ACTUATORS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

BALANCED ACTION TAPS
take tough jobs in their stride . . .

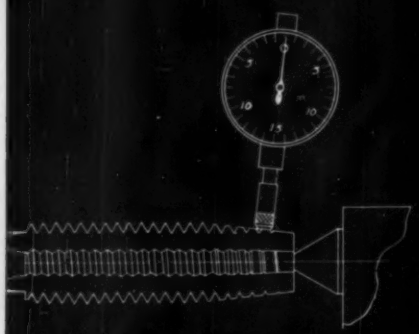
Taps built with Balanced Action work *with* the job, not *against* it. They smooth out production flow—even with hard-to-tap metals—insure hole-accuracy—and prolong useful tap life.

Winter gages, plug and ring, thread and plain are also made with "Balanced Action" accuracy.

CALL YOUR WINTER DISTRIBUTOR

WINTER BROTHERS COMPANY
Rochester, Michigan, U.S.A.

Distributors in principal cities. Branches in New York • Detroit • Cleveland • Chicago • Dallas • San Francisco • Los Angeles
Division of National Twist Drill & Tool Co.

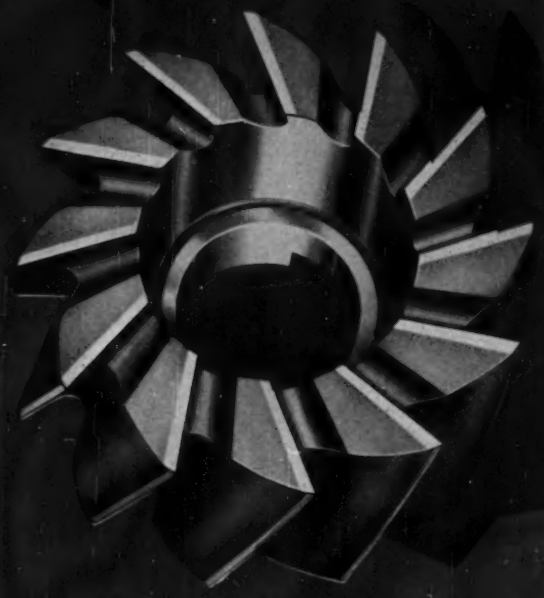


ACCURATE AND CONCENTRIC CHAMFERS:
By holding shank, chamfer, and thread concentricity to very close limits, hole-accuracy with Balanced Action taps is assured.

EXACT FLUTE SPACING

PRECISION CHIP AND DEPTH CONTROLS

UNIFORMITY OF FLUTE CONTOURS



Research that anticipates new and unusual cutting problems

In many tool applications, National's continuing program of basic research has brought about significant improvements in the service life of National products.

National users who are faced with new or unusual cutting problems are invited to call upon our research staff for assistance and advice.

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NATIONAL TWIST DRILL AND TOOL COMPANY
Rochester, Michigan, U.S.A.

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The search that never ends.
Unparalleled research facilities available.

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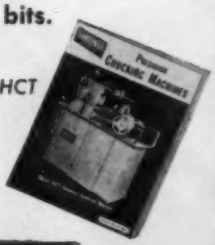
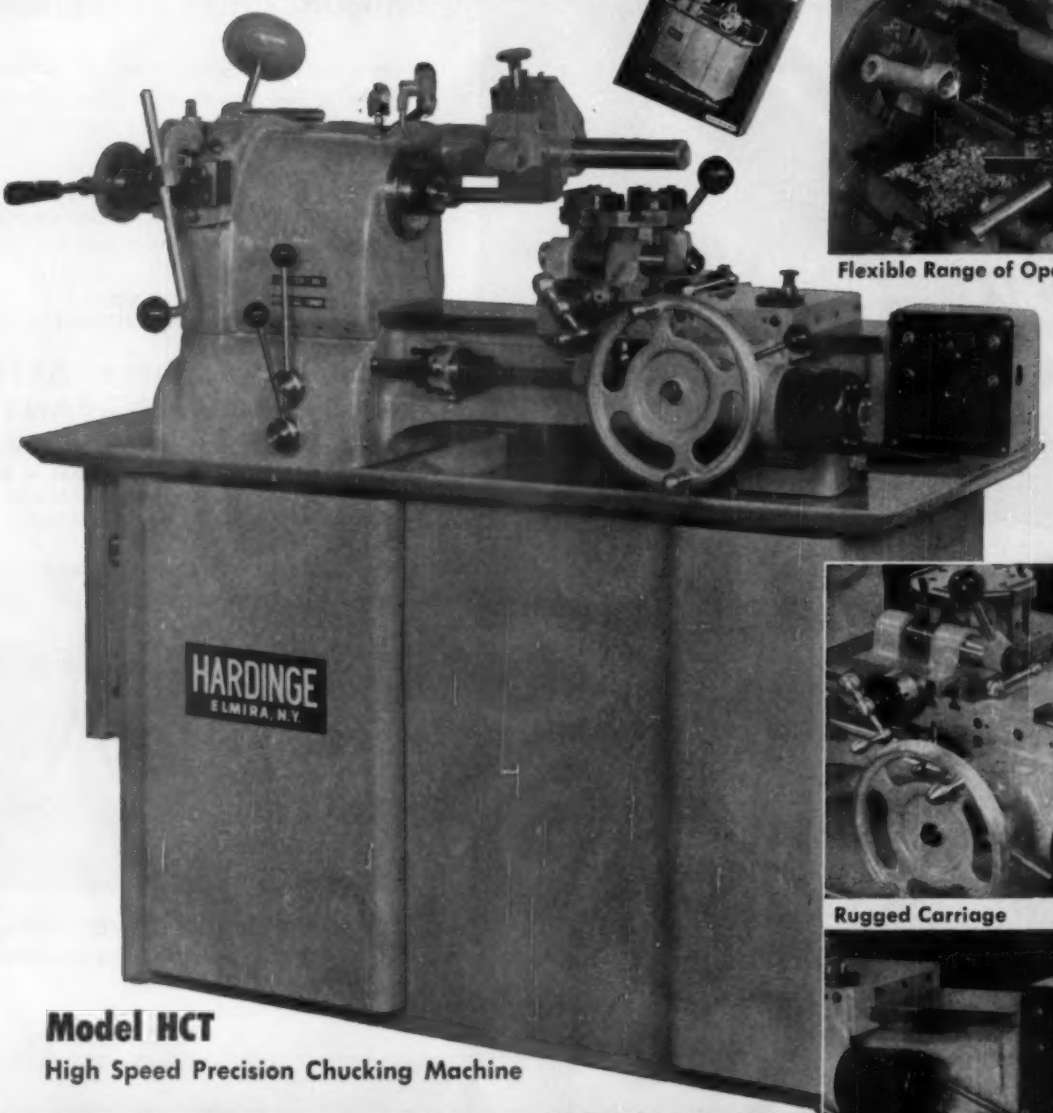
HARDINGE
ELMIRA, N.Y.

PRODUCTION
With Tool Room Accuracy

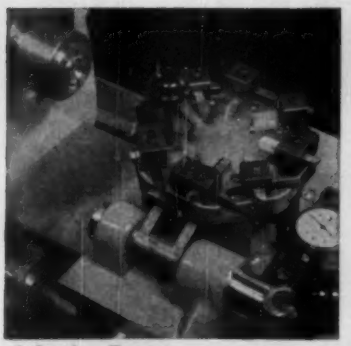
Hardinge Precision Chucking Machine HCT finish diameters, recesses, shoulders, back faces, front faces, and cuts precision threads in *one setting — all concentric* with each other. Tooled inexpensively with standard tool bits.

For complete information write for Bulletin HCT



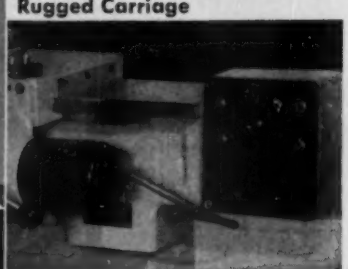


Model HCT
High Speed Precision Chucking Machine


8-Station Turret

Flexible Range of Operation

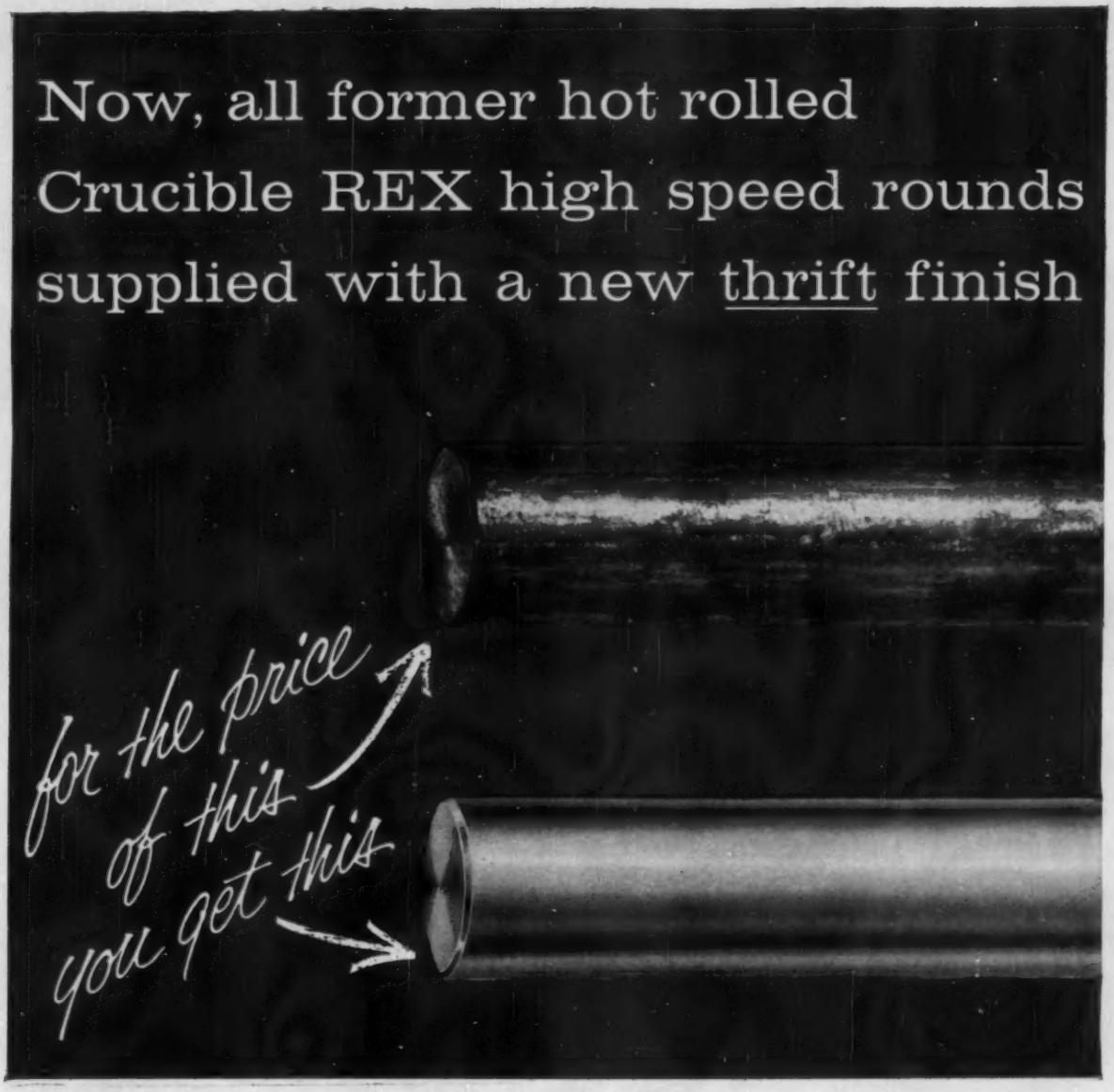
Rugged Carriage


Independent Variable Carriage Feed

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

OFFICES IN PRINCIPAL CITIES. Export Office: 269 Lafayette Street, New York 12, N. Y.

Now, all former hot rolled Crucible REX high speed rounds supplied with a new thrift finish



Here's a revolutionary, new Crucible policy designed to provide an improved product—save time and processing costs. Now, Crucible furnishes all REX® high speed rounds from ⅝" up with a machined surface, close to size and free from decarburization. All bars from ¼" to ⅝" round are supplied cold finished.

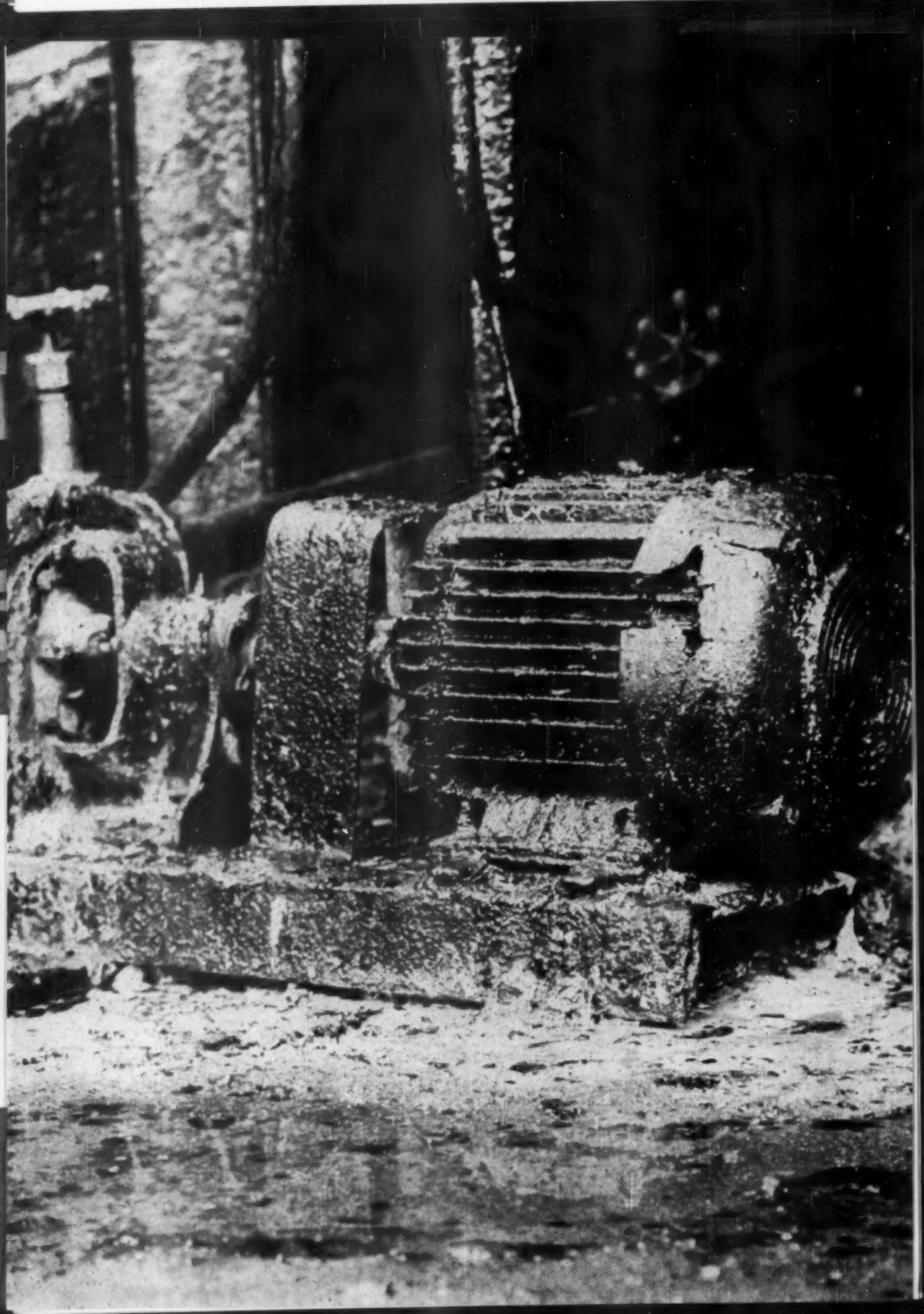
This new *thrift* finish means important savings to you — whether you've been paying extra for decarburization and stock removal, or grinding or rough turning rounds in your own shop. Of course, where extremely close tolerances are demanded, precise centerless grinding is still available at a small extra.

It's another Crucible "first" that offers you substantially more for your high speed steel dollar. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

Canadian Distributor—Railway & Power Engineering Corp., Ltd.



Westinghouse motors double normal life for this application

. . . at Ohio-Apex Div., Food Machinery and Chemical Corp.

this standard Life-Line A motor still pumping corrosive POC I_3 after 12 continuous months without maintenance or down time.

"We must have a dependable motor, completely sealed and corrosion-resistant," says Mr. Burton Fitch, Ohio-Apex Division of Food Machinery and Chemical Corporation, Nitro, West Virginia. "A corrosive atmosphere, plus phosphorous oxychloride drip and seepage, cuts motor life. Westinghouse Life-Line® "A" motors have already passed this replacement point twice . . . and are still going strong."

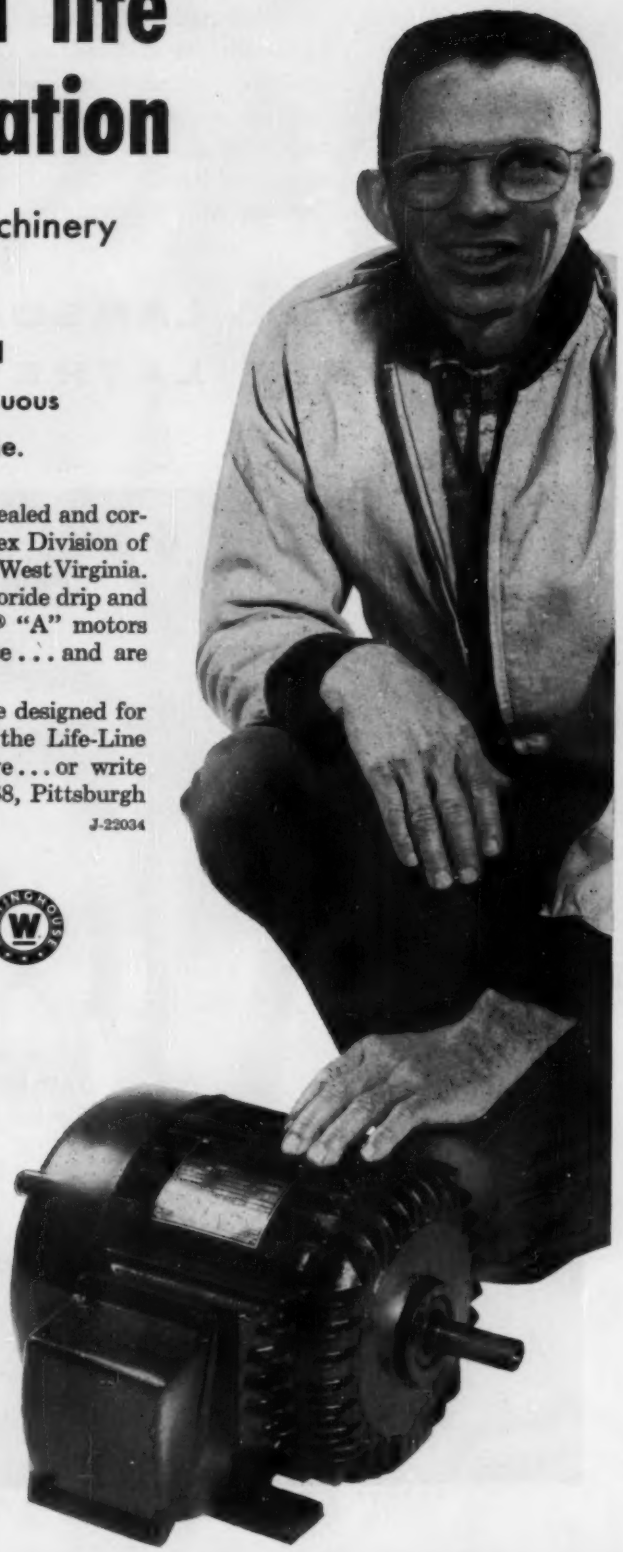
Westinghouse motors last longer because they're designed for modern industry's needs. For more facts about the Life-Line "A", call your local Westinghouse representative . . . or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-22034

YOU CAN BE SURE . . . IF IT'S

Westinghouse

"Westinghouse Life-Line "A" motors have cut our motor costs substantially . . . helped us keep our chemicals moving down the line," says Mr. Fitch of Ohio-Apex. "Their built-in ruggedness, plus foolproof sealing against corrosion, means longer life, lower maintenance."



Unretouched photo of Life-Line "A" three-hp motor driving chemical pump at 1730 rpm, 100 gpm at Ohio-Apex.

The ONLY Turret Lathe with a fully automatic thread-chasing cycle!

Here is full turret lathe versatility and a threading attachment with a fully automatic cycle — all in one machine. Now you can be sure of concentricity of threading with other lathe work, *all done in one chucking*, with the time saving of the Auto-Threader! Nowhere else in the world can this be found on a turret lathe.

This Auto-Threader will chase straight or taper threads — or a combination — internal or external, from the front of the machine.

Concerning this J&L development, a customer writes: "We are tripling production on many of our items."

Write for descriptive folder No. 5440. JONES & LAMSON MACHINE COMPANY, 502 Clinton Street, Springfield, Vermont.

JONES & LAMSON TURRET LATHES

the man who needs a new machine tool is already paying for it

Turret Lathes • Fay Automatic Lathes • Milling & Centering Machines • Optical Comparators • Thread Tools — Thread & Form Grinders

"A new press just wasn't in the cards...

so we rebuilt this one and saved ourselves a lot of money!" And it can be done with any Bliss press. Bliss has developed 42 modernization "packages"—pre-engineered assemblies—all you need to make an old press act young again. Add faster clutches, modern adjustments, more compact gearing, greater capacity. Do it in *your* own plant to keep downtime at a minimum. Or have Bliss do a complete rebuilding job for you.

Which is better? It's up to you. We'll give you the facts, but it's up to you. For here at Bliss, we consider the sale but the beginning of our responsibility. Which is what we mean when we say, "Bliss is more than a name... it's a guarantee."

BLISS
SINCE 1857

E. W. BLISS COMPANY · Canton, Ohio

100 years of making metal work for mankind

PRESSES • ROLLING MILLS • ROLLS • DIE SETS • CAN MACHINERY • CONTRACT MFG.

SOME OF OUR JIGMIL USERS

American Bosch Arma Corp.
American Machine & Foundry Co.
American Type Founders, Inc.
Axelson Manufacturing Co.
Blanchard Machine Co.
Blaw-Knox Company
Bucyrus-Erie Co.
Cameron Machine Company
Caterpillar Tractor Company
Continental Gin Company
C. B. Cottrell & Sons Co.
Crankshaft Machine Company
A. B. Dick Company
Ekstrom, Carlson & Co.
Fellows Gear Shaper Co.
Food Machinery & Chemical Corp.
Foote Bros. Gear & Machine Corp.
Gillette Safety Razor Co.
Harris-Seybold Co.
Hartford Special Machinery Co.
Frank G. Hough Co.
Jeffrey Manufacturing Co.
Joy Manufacturing Co.

A. O. HOLMBERG, Vice President—Manufacturing
THE GOSS PRINTING PRESS COMPANY
Division of Miehle-Goss-Dexter, Incorporated

a man who came

"I first heard of the JIGMIL Technique for boring accurate holes in precise locations at an engineering lecture-meeting in Philadelphia. What I heard made me curious because the story seemed exaggerated."

Kempsmith Machine Company
Kidder Press Co., Inc.
McNally-Pittsburg Mfg. Corp.
Miehle Printing Press & Mfg. Co.
Morris Machine Tool Co.
Osborn Manufacturing Co.
Oster Manufacturing Co.
Package Machinery Co.
Paper Converting Machine Co.
Parrish Machine Co., Inc.
Rockford Machine Tool Co.
S & S Corrugated Paper Machy. Co.
Stacy Machine Works, Inc.
Sunnen Products Company
George W. Swift, Jr., Inc.
Torrington Co.
Vandercook & Sons Inc.

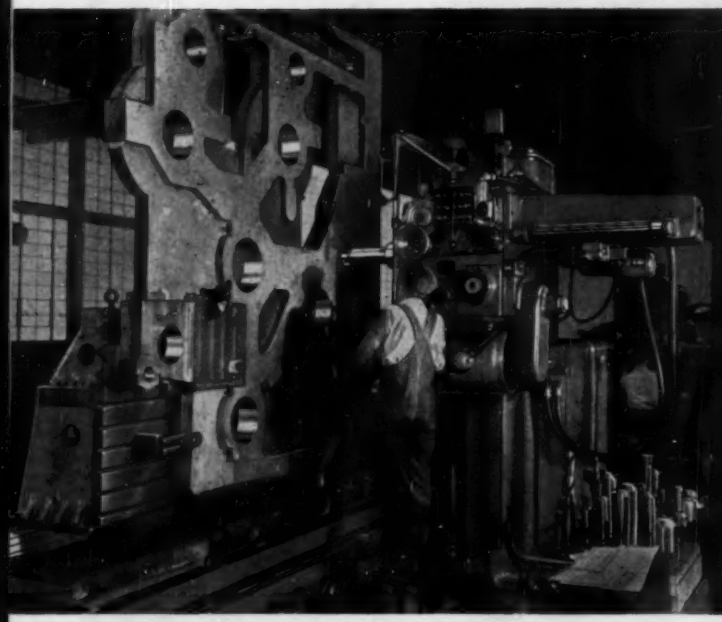
"I accepted an invitation to go to Fair Street and there saw the JIGMIL Technique in operation doing jigless boring to degrees of economy and precision that verified what I had heard in the lecture. The gains that were apparent from the analysis made for us by the DeVlieg engineers caused us to purchase a number of JIGMILS. These machines have been in use for several years. We have experienced many advantages. The principal ones are improved quality and a considerable reduction in machining, inspection and assembly times. The quality of the work resulting from the outstanding JIGMIL accuracy has had a far-reaching improving effect on the general quality and performance of our product."

A. O. HOLMBERG

WILL YOU BE THE NEXT TO VISIT FAIR STREET

DE VLIEG MACHINE COMPANY

to Fair Street



A FEW PROVEN ADVANTAGES OF THE JIGMIL TECHNIQUE—

- Eliminates cost of expensive jigs and production delays resulting from their manufacture.
- Simplifies tooling.
- Employs automatic functions to reduce factors of human error even in close tolerance work.
- Makes possible greater flexibility of product design.
- Improves end product by permitting interchangeable assembly of parts without hand fitting.
- Increases production and product accuracy.

ACCURACY IS AN ECONOMY!

A TYPICAL EXAMPLE OF JIGMIL ACCURACY

Goss uses the JIGMIL Technique for boring components of their famous high-speed newspaper, magazine and color printing presses. Illustrated above is one of the side frames for an 80 ft. multi-color press recently built by Goss. This part was bored on a Model 4B-120 SPIRAMATIC JIGMIL. JIGMILS were used for boring approximately 2260 holes in the side frames and gear boxes for this press. In the assembled press, the accuracy of hole size and spacing made it possible to hold the register of 5 colors within .001".

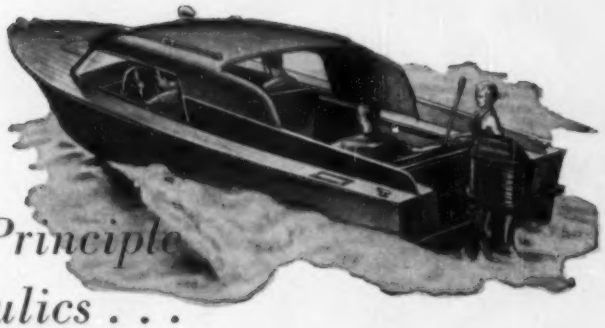
Our newest catalog will help you decide. May we send it?

DeVlieg

SPIRAMATIC JIGMILS®

ACCURATE HOLES IN PRECISE LOCATIONS

450 FAIR STREET, FERNDALE, DETROIT 20



The "Outboard Motor" Principle Applied to Hydraulics . . .

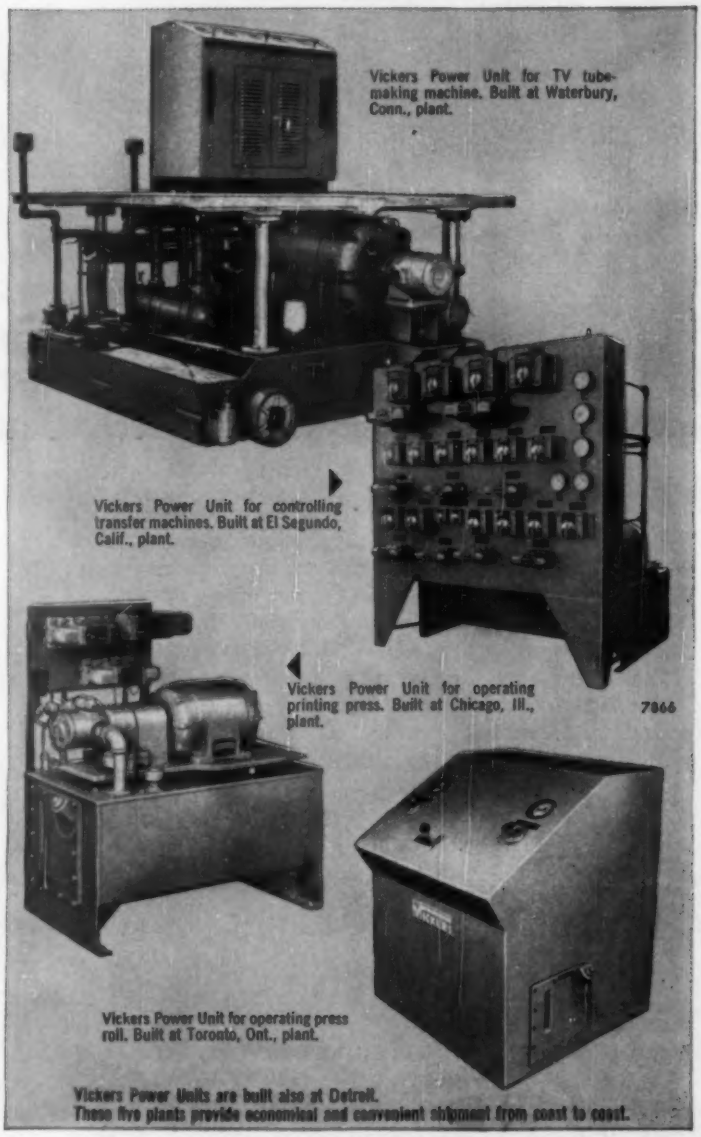
VICKERS® "Packaged" Hydraulic Power Units Are Compact, Convenient and Economical

The outboard motor is popular because it is a complete, self contained power package . . . quick and easy to apply.

Vickers Custom-Built Power Units provide a comparable packaged system for the hydraulics of any particular machine or job. Built to the exact needs, it is compact, efficient, and very quick and easy to apply.

All necessary pumps, valves, intermediate piping, motors, controls, oil reservoir, oil filters, air cleaners, oil level gauges, fittings, etc. are included, as well as electronic components if used.

You are assured dependable performance. Design is improved and simplified, time and cost of installation are reduced, appearance is better, servicing is easy. Each unit is pretested at the factory and is ready for immediate operation. Vickers undivided responsibility for the entire hydraulic control system is important to both the machine builder and his customer. Write for Bulletin 52-45.


Vickers Power Unit for TV tube-making machine. Built at Waterbury, Conn., plant.
Vickers Power Unit for controlling transfer machines. Built at El Segundo, Calif., plant.
Vickers Power Unit for operating printing press. Built at Chicago, Ill., plant.
7866
Vickers Power Unit for operating press roll. Built at Toronto, Ont., plant.
Vickers Power Units are built also at Detroit.
These five plants provide economical and convenient shipment from coast to coast.

VICKERS INCORPORATED
DIVISION OF SPERRY RAND CORPORATION
Machinery Hydraulics Division
ADMINISTRATIVE and ENGINEERING CENTER
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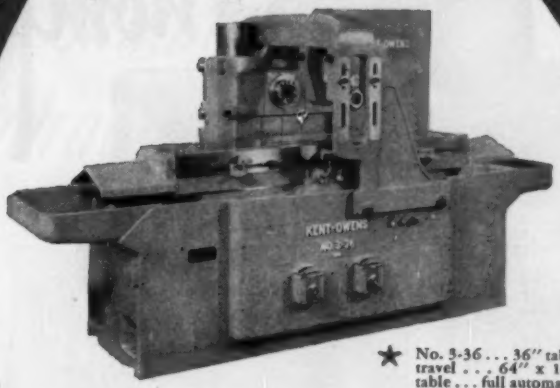
ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

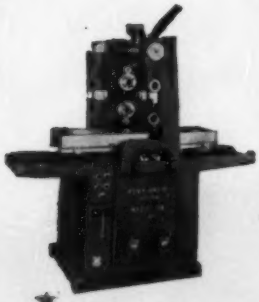
Every one a Star

for speedy accurate milling!



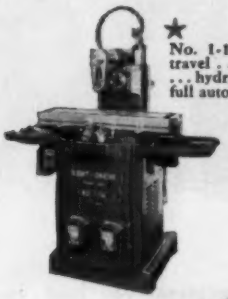
★ No. 3-36 . . . 36" table travel . . . 64" x 16" table . . . full automatic hydraulic feed.

★ No. 2-20 . . . 20" table travel . . . 42" x 12" table . . . full automatic hydraulic feed.

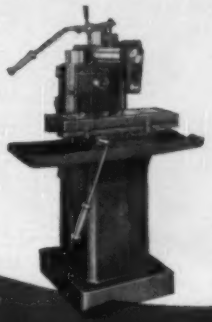


★ No. 2-20DS . . . Double Spindle for two milling operations . . . 20" table travel . . . 42" x 12" table. Hydraulic feed.

You'll turn out milling jobs with stepped up speed and accuracy with the work on Kent-Owens Machines! These extra-rugged Millers are performance-proved . . . simple . . . versatile . . . practical in every detail. Advanced features throughout! Twin-post head mounting assures balanced load. Only two gear contacts, motor to spindle, means greater cutting efficiency. Check your needs! Write today for bulletins on wide range of hydraulic and hand-operated machines. Also, let Kent-Owens design and build your tooling and special machines. Kent-Owens Machine Co., Toledo, Ohio.



★ No. 1-14 . . . 14" table travel . . . 32" x 9" table . . . hydraulic table feed . . . full automatic cycle.



★ No. 1-M . . . Hand feed to table and head . . . 25" x 9" table travel . . . head counter-balance is adjustable.

CALL ON

KENT-OWENS

for milling machines

KENT-OWENS REPRESENTATIVES

Thompson

Tests show only a 3° rise over ambient temperatures in the new Thompson Hydra-Cool hydraulic system after 24 hours' continuous operation. No machine distortion — no damage to hydraulic seals and valves.

Here's real news—the first major improvement in hydraulic surface grinding in the past 20 years.

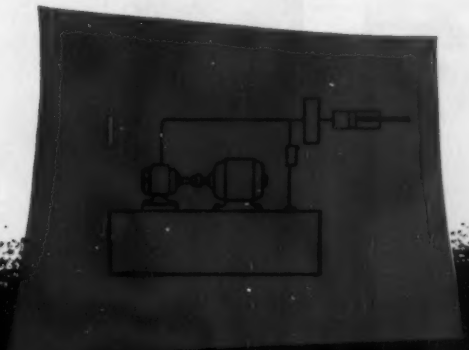
Heat, generated by continuous production grinding and constant hydraulic system operation, has long been a serious problem. General machine distortion, caused by extremes of temperature on top and bottom surfaces, has made close tolerances impossible to achieve. Excessive heat is destructive to the hydraulic system itself. Various and costly corrective measures have failed to solve this heat problem. Oil cooling and insulating devices have been only partially successful.

Now, the new Thompson Hydra-Cool system eliminates hydraulic heat *at its source*—with the new Thompsons, you hold your tolerances, no matter how close they may be or how long the run! Exhaustive tests have convincingly proved that, even after 24 hours of continuous operation, temperatures in the new Thompson Hydra-Cool hydraulic system have risen *only 3 degrees above ambient temperatures.*

To you, the new Thompson Hydra-Cool hydraulic system assures greater precision, less scrap loss, more trouble-free hydraulic operation—actual savings in dollars and cents! The new Hydra-Cool hydraulic system is available on all types of Thompson machines 40 inches and above in work length AT NO EXTRA CHARGE.

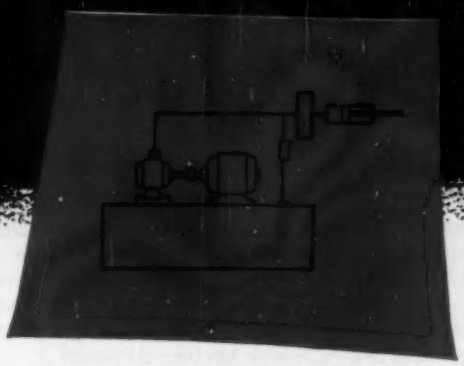
Again... THOMPSON LEADS IN SURFACE GRINDING ENGINEERING

— grinders eliminate hydraulic system heat

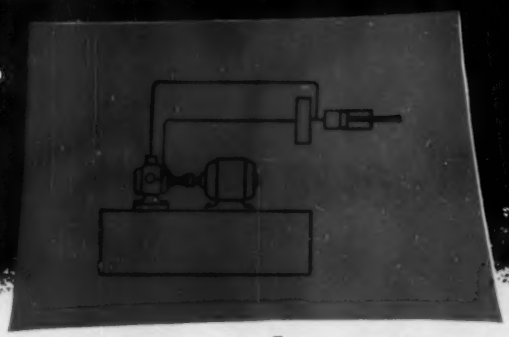


System No. 1—Constant volume hydraulic pump systems provide a continuous flow of oil for table reciprocation with pressures controlled by a relief valve set for greatest work need. Total pump volume circulates throughout the system continuously, generating heat even when the table is at rest. Oil coolers are a necessity on production work involving precision grinding.

WHICH TYPE OF SYSTEM WOULD YOU RECOMMEND?



System No. 2—Variable volume hydraulic systems regulate oil flow to the work requirement at adjustable rates, reducing oil flow through the system to only that volume necessary for each job. This limiting of flow through the system is an improvement over constant delivery systems but pressures within the system are still controlled by preset relief valve settings so that near constant pressures are maintained throughout the run. Oil coolers are also necessary for these systems.



The Thompson Hydra-Cool System—New, pressure-compensating, variable delivery systems on new Thompson grinders control the rate of table movement and operating pressures automatically through a single hand lever control. As operator adjusts rate of table movement for the initial phase of each job, pressures within the system adjust automatically for the exact requirement to move the table smoothly and a constant speed. This modern pressure servo type system keeps HP input to the minimum. When the table is stopped, the pump ceases to pump oil. Hydraulic system heat remains at levels close to the ambient temperatures of the room. Distortion of the grinder bed is completely eliminated . . . at the source, without accessory cooling systems or expensive insulation methods. YOU GET THESE ADDED ADVANTAGES AT NO EXTRA COST.

*PATENT APPLIED FOR

MAIL THIS COUPON TODAY!

The Thompson Grinder Company • • Springfield, Ohio, U. S. A.

Please send me your free booklet giving important facts on the new Thompson Hydra-Cool Hydraulic System.

NAME ..... TITLE .....

COMPANY .....

ADDRESS .....

CITY ..... ZONE ..... STATE .....

Thompson

SURFACE GRINDERS

The ordinary fasteners securing the worm wheel to the drum shaft in this automatic screw machine loosened, causing $120 worth of damage to parts. Labor for the repair job cost $100. The ordinary fasteners were replaced with self-locking UNBRAKOS, and there has been no trouble since.

Vibration won't loosen self-locking UNBRAKO socket cap screws

HOW IT LOCKS. The tough, resilient Nylok locking pellet keys itself into the mating threads. It forces threads together and locks the screw securely—whether or not the screw is seated.

UNBRAKO socket screws with the Nylok* self-locking device eliminate fastener problems caused by vibration.

Take the drive system in the automatic screw machine illustrated above, for example. The screws originally used to secure the worm wheel to the drum shaft loosened, causing considerable damage, besides loss of production time. These have now been replaced with self-locking UNBRAKO socket head cap screws and the trouble has been eliminated.

An UNBRAKO socket screw with the Nylok self-locking device is a single unit. Just screw it into any tapped hole. Seated or not, it locks positively wherever wrenching stops. Constant vibration or endless running of a machine won't affect these self-locking UNBRAKOS. The screws will not work loose!

Write today for your copy of Form 2193, which gives catalog and technical data on the complete line of UNBRAKO socket screws with the Nylok self-locking device. Or see your local industrial distributor. Unbrako Socket Screw Division, STANDARD PRESSED STEEL CO., Jenkintown 1, Pa.

UNBRAKO® SOCKET SCREW DIVISION

STANDARD PRESSED STEEL CO.

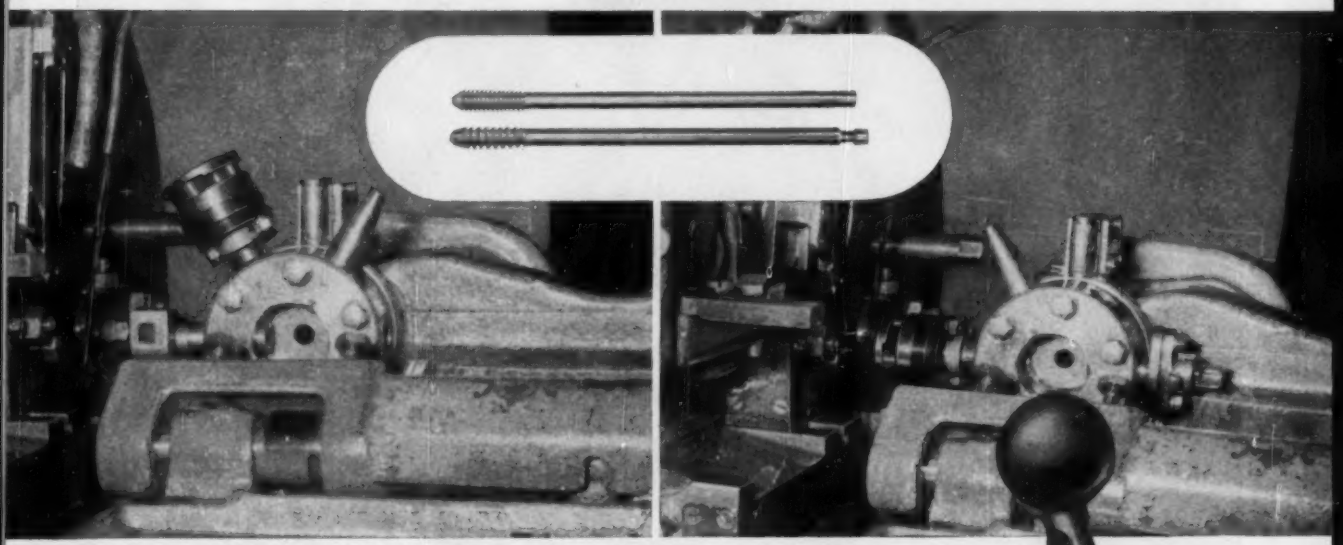
SPS

JENKINTOWN PENNSYLVANIA

*T.M. Reg. U.S. Pat. Off., The Nylok Corporation

Westinghouse adds new productive capacity to present metal turning equipment

and eliminates costly secondary machining operation



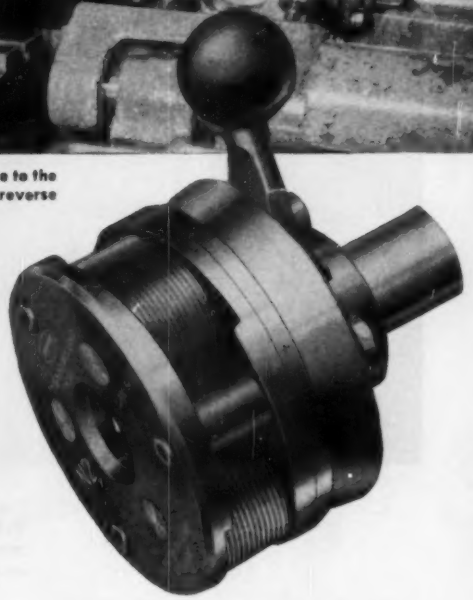
In this setup, on a Brown & Sharpe automatic, down time was reduced to a minimum, due to the fact that it was possible to thread more than 500,000 pieces before it was necessary to reverse the rolls—a distinctive Acme-Fette feature which doubles the life of threading rolls.

ROLLS THREADS . . . faster and better

WITH NEW ROTATING — NON-ROTATING

Acme-FETTE

THREAD ROLLING HEAD AND ROLLS



With an Acme-Fette THREAD ROLLING HEAD in the primary setup, Westinghouse completed these electric appliance terminals without a secondary machining operation. Time saved in rehandling alone more than equalled the cost of the head and rolls.

Acme-Fette Thread Rolling Heads are available in 8 sizes, in capacities from $\frac{1}{16}''$ to $2''$, at only a fraction of the cost of specialized equipment. The same head can be used in both rotating and non-rotating spindle machines—either horizontal or vertical.

For cost-reducing ideas showing how you can combine thread rolling operations on your present equipment, send for Catalog NAF-57.

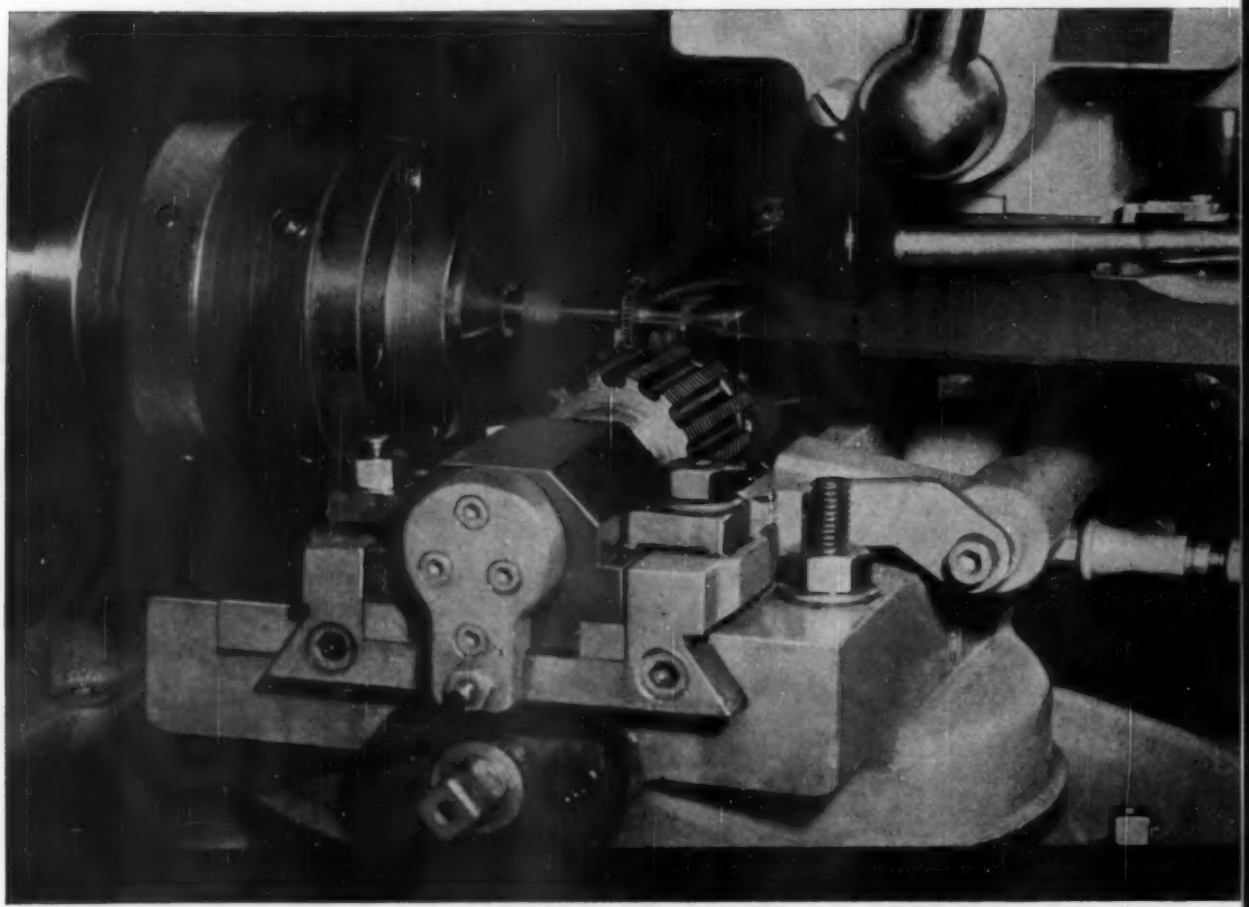
- **Makes threading from the end now possible on any rotating or non-rotating spindles.**
- **Rolls threads up to 5 times faster than—and without chip problems associated with—thread cutting.**
- **Provides smoother threads, of consistently closer tolerance, with greater tensile strength—and without cratering at the thread crest.**

National Acme

THE NATIONAL ACME COMPANY, 171 E. 131ST ST., CLEVELAND 8, OHIO • Sales Offices: Newark 2, N. J., Chicago 6, Ill., Detroit 27, Mich.

HOBBING PRECISION GEARS

within precision Class 2 AGMA tolerances.....



Fine-pitch instrument gears are cut on Barber-Colman Precision No. 6-10 Hobbing Machines at Belock Instrument Corporation. For their most accurate gears, Belock uses Barber-Colman Class AA hobs exclusively.

with standard-type precision hobbing machines

The Belock Instrument Corporation manufactures complex electronic and electromechanical systems and components. The constant demand placed on them for greater accuracy in these instruments requires all gears to be cut to very close tolerances and yet be completed on a practical production basis.

Belock hobs such gears consistently within Precision Class 2 AGMA tolerances, using a battery of *standard-type* Barber-Colman Precision No. 6-10 hobbing machines. These are unusually close tolerances and the use of *standard-type machines* for these gear accuracies is a good reason for taking a close look at the elements and methods they employ.

here's how they do it:
Gear blanks are machined to Precision AGMA tolerances. Then, for maximum accuracy in hobbing all precision gears, Barber-Colman Class AA single-thread ground hobs are used. These hobs are manufactured with tapered bores, since taper-bore hobs can, with greater ease, be mounted more accurately on the hob arbor to eliminate runout. These hobs are resharpened to original class AA accuracy using a Barber-Colman No. 6-5 Hob Sharpening Machine.

The gears are finish-hobbed on Barber-Colman Precision No. 6-10 Hobbing Machines. These machines hold a precision relationship between the rotation of the work and the rotation of the hob which allows them to consistently hob gears to these fine tolerances.

Barber-Colman Precision No. 6-10 Hobbing Machines are built with large precision index worm gears and single-thread worms for maximum tooth spacing accuracy. All vital machine parts are specially selected for close tolerances.

If you have a problem of producing consistent accuracy in gear cutting, consult Barber-Colman Hobbing Engineers for assistance. They can help you obtain any class of accuracy you desire with the most practical equipment for doing it.

this is an actual production record:

GEAR	HOB	OPERATION
Diametrical Pitch — 64	Class AA Ultra-Precision	Feed — .015"/rev.
Pressure Angle — 20°	2" Diameter, Taper Bore	Speed — 120 sfm
Outside Diameter — .7812"	Pieces per Sharpening — 720	
Pitch Diameter — .7500"	Stock Removal per Sharpening — .005"	
Face Width — .093"		
Material — 303 Stainless, 30-35 RC		

BARBER-COLMAN COMPANY

618 ROCK STREET • ROCKFORD, ILLINOIS

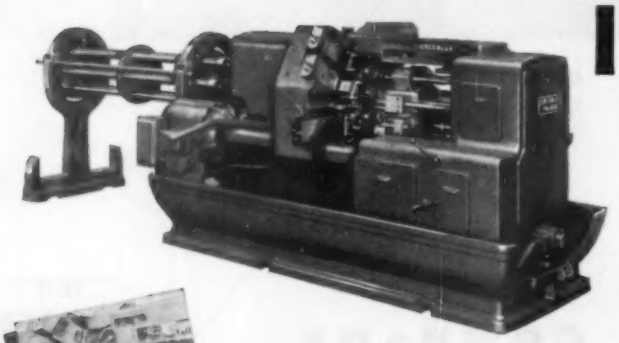
Hobs • Cutters • Reamers • Hobbing Machines • Hob Sharpening Machines

BARBER COLMAN

1. Simplified cross-slide camming
2. Interchangeable cross-slide tool holders
3. Quick-adjusting stroke mechanism
4. Rapid speed and feed changes
5. Wide-open, easily reached tooling area
6. Built-in threading feed and drive
7. Easily accessible main toolslide holders
8. Stationary type collets changed quickly

eight big reasons why you get *Fast Setups* on GREENLEE BAR AUTOMATICS

In plant after plant countless hours of setup time are saved each year on Greenlee Bar Automatics. Similar savings in time and money can be achieved in your own plant. Greenlee has on-the-job case studies to prove it. Whether your responsibility lies in the field of management . . . production . . engineering . . . or purchasing you owe it to yourself and your company to call in the Greenlee man. Let him show you why and how faster setups on a Greenlee pay off in greater profits.



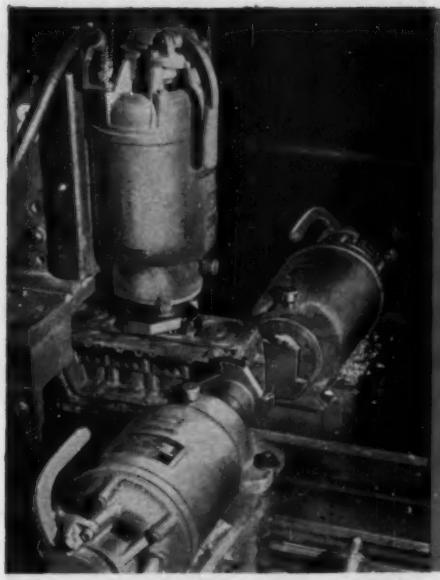
PRODUCTION MACHINERY
GREENLEE

4-SPINDLE...6-SPINDLE
SECOND-OPERATION
PNEUMATIC STOCK FEED

WRITE TODAY
FOR CATALOG
A-405

PRODUCTION MACHINERY
GREENLEE

GREENLEE BROS. & CO.
1728 Mason Avenue
Rockford, Illinois



MILL UP TO 3 SIDES AT ONE TIME

WITH

Onsrud®

A-242S

TRI-WAY MILLING MACHINE

a member of the COMPLETE family of Onsrud Milling Machines designed specifically for Aluminum and related nonferrous milling

PROOF of the tremendous productivity of Onsrud milling machines designed for nonferrous milling is shown by this production study. This kind of production is typical of the advantages that can be yours with every Onsrud milling machine.

THE PART: Outboard motor cylinder block, aluminum alloy casting 7″ wide x 13″ long and 6″ high.

THE MACHINE: Onsrud A-242S Tri-Way Milling Machine with one vertical and two horizontal opposed milling heads.

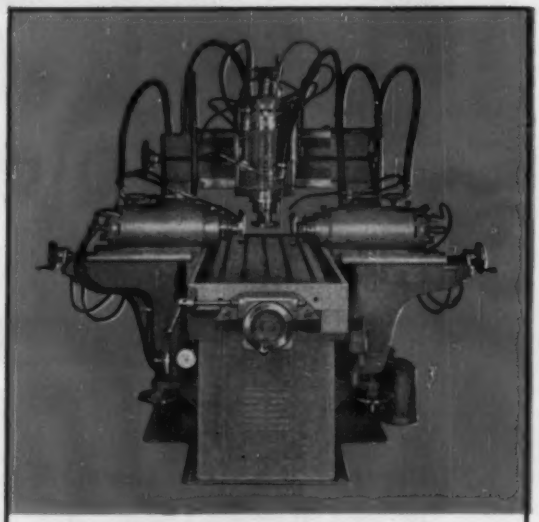
OPERATION: Machine three sides of block in on set-up and in one pass.

ACCURACY: Flatness tolerance ± 0.0003″. Parallel tolerance ± 0.001″.

PRODUCTION: Three parts per minute.

CUTTER LIFE: 500 to 1,000 parts per regrind.

Onsrud high speed milling production is only possible because Onsrud machines are designed and built specifically for milling aluminum and related nonferrous metals. The cutter speeds and feeds are exactly right to give smooth finish and precision . . . at super-high production speeds.



Onsrud A-242S Tri-Way Milling Machine, for milling up to three sides at one time, of any part square or rectangular in cross section. Planer type table with variable feed up to 258 IPM. Cutter motors Onsrud 10 HP, 3,600 RPM, liquid cooled.

Write for Information

Let us give you complete data on the Onsrud A-242S Tri-Way Milling Machine...and all other Onsrud milling machines for nonferrous metal milling. Get the facts on these proved, high speed production machines. Your inquiry is cordially invited.

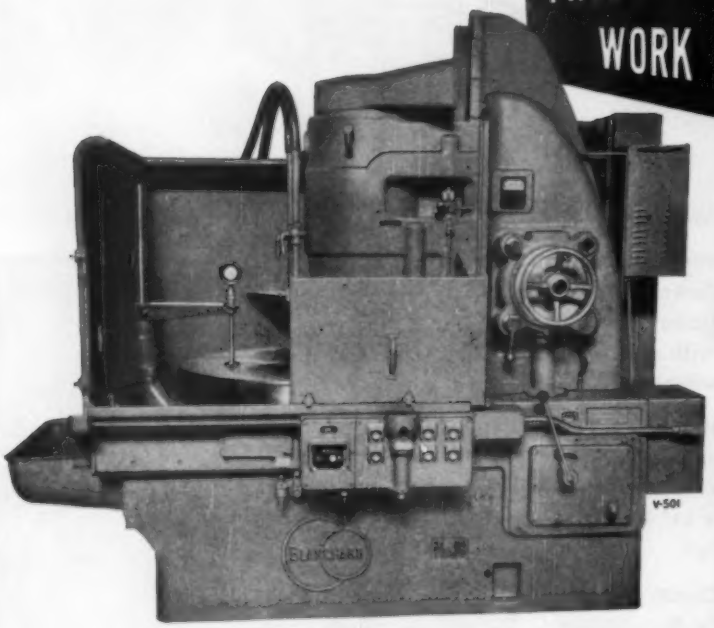
ONSRUD
MACHINE WORKS, INC.
machine tool division
7712 Lehigh Avenue
Niles 31, Illinois
(SUBURB OF CHICAGO)

Onsrud® HIGH SPEED **MILLING MACHINES** FOR ALUMINUM AND RELATED NONFERROUS METAL MILLING

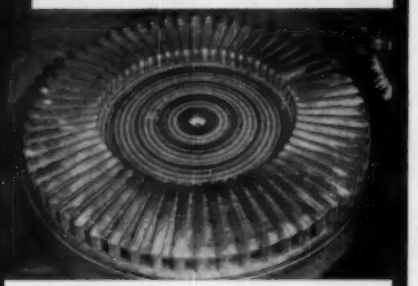
For doing things *better* by doing things *differently!*

for BEST results in surface grinding...
PUT IT ON THE BLANCHARD

PRODUCTION WORK

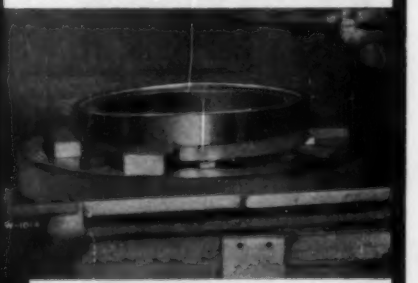


SIDE PLATES. 9" x 18" plates ground from rough on No. 18 Blanchard with 36" chuck. Stock removal 1/16" to 1/8" per side. Held flat within .003", parallel to .001", and to dimension tolerance of ±.001". Production: 30 surfaces per hour.

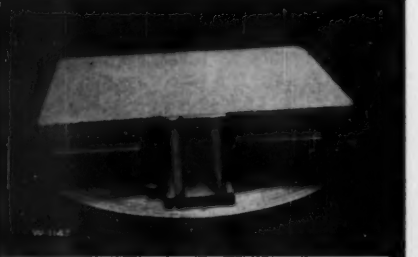


CONNECTING LEVERS. Cast iron levers ground in special magnetic fixture with pins located in "vee's". Stock removal per side is 1/32" to 1/16"; must be flat and at right angles to pins. No. 18 production: 180 pieces per hour, compared to 20 pieces per hour by former method used.

MAINTENANCE AND ODD LOT WORK



HARDENED STEEL PUNCHES. This 24-13/16" dia. punch, reground on a No. 18, is centered radially on 36" magnetic chuck. Duplicate circumferential and radial shear reliefs are generated with two setups.



GRANITE SURFACE PLATES. A No. 18 Blanchard reconditions this 18' x 34" granite surface plate by grinding it flat within .0002". 3/16" of stock is removed in 5 hours.

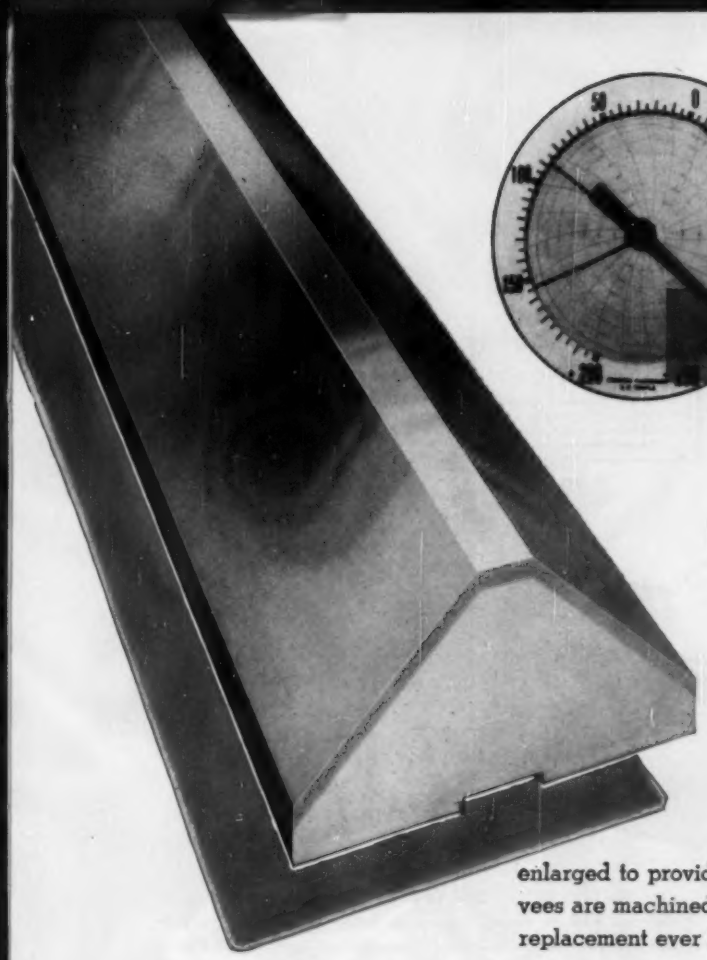
Blanchard Grinders are used throughout industry on surface grinding jobs that demand the utmost in production, finish and accuracy.

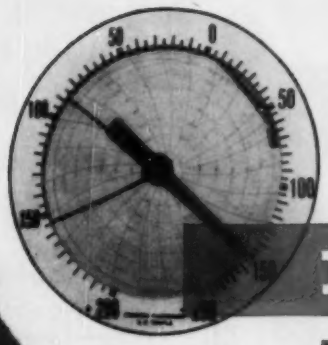
Whatever *you're* surface grinding, there's a Blanchard designed to do the job speedily and accurately.

PUT IT ON THE **BLANCHARD**

Send for free copies of "Work done on the Blanchard", fifth edition, and "The Art of Blanchard Surface Grinding".

THE BLANCHARD MACHINE COMPANY
64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.





150° BELOW

After hardening to 62 Rockwell C the solid tool steel "AMERICAN" Pacemaker bed vees are stabilized in the deep freeze at 150 degrees below zero.

This freezing treatment not only raises the surface hardness but thoroughly stabilizes the metallurgical structure and prevents twisting or warping.

On the new DeLuxe Model "AMERICAN" Pacemaker the bed vees have been enlarged to provide extra large bearing area for the carriage. The vees are machined to gauge tolerances for interchangeability should replacement ever be required.

This is but one of the outstanding advantages offered by the new DeLuxe Model Pacemaker. Others are illustrated and described by bulletin No. 124—want one?

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

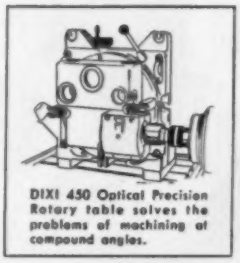
DIXI 60
horizontal optical jig borer

The ONLY Horizontal Jig Borer Built Today! Combines the ACCURACY of the Vertical Spindle With the VERSATILITY of the Horizontal Spindle

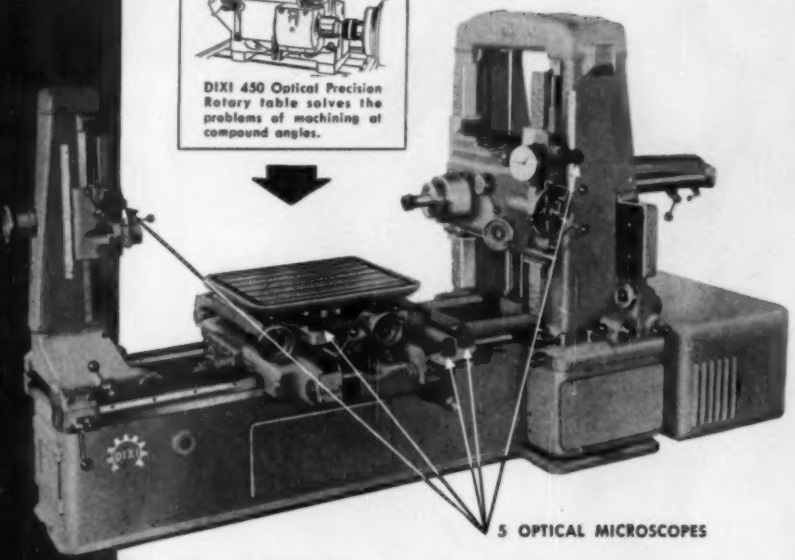
ACCURATE:
Optical settings provide an overall accuracy of .0002.

VERSATILE:
Optical settings for operations in all planes and compound angles . . . equally suitable for tooling, short-run or production work . . . permits JIGLESS boring, facing, milling and drilling.

PRODUCTIVE:
Saves time, labor & costs . . . Unclamping, positioning, fine adjustment, reclamping and rechecking can be made in less than 10 seconds.



DIXI 450 Optical Precision Rotary table solves the problems of machining at compound angles.



5 OPTICAL MICROSCOPES

The DIXI Optical Reversing Process assures perfect alignment as well as round, taper-free holes. In work pieces with line bores on opposite sides, this is obtained by optically indexing the built-in rotary table 180°, locking the spindle feed and using the hydraulic table in-feed instead. Electrical infinitely variable speed spindle drive; infinitely variable hydraulic feeds; special features eliminate effect of spindle over hang on accuracy.

Made in Switzerland — All measurements in inches

- Guaranteed service by factory trained staff
- Engineering staff available for consultation
- Spare Parts in New York stock
- Your operators trained

DIXI 60 now in wide use in leading aircraft and manufacturing plants throughout the United States.

THIS VERSATILE MACHINE IN OPERATION at our New York, and other conveniently located Demonstration Centers.

Our Headquarters in New York City

MBI

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export & import ltd.

A Division of Machinery Builders, Inc.

475 Grand Concourse, Bronx 51, New York

"Over 25 years experience in designing & building machinery"

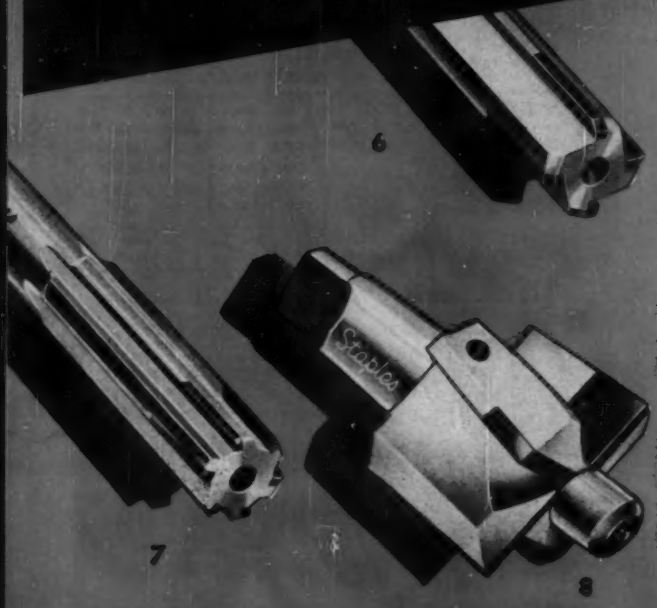
Staples

ROTATING CARBIDE TOOLS

Old skills modern facilities give you premium Carbide Tool performance

What makes a carbide tool outstanding? Staple's answer: Ultra-modern facilities in the hands of the finest Cincinnati craftsmen. Your assurance of a new kind of carbide tool performance—whether special or standards!

1. Stub Screw Machine Reamers (Solid and Expansion Types) 2. Expansion Reamers (Patented) 3. Shell End Mills 4. End Mills 5. Twist Drills (solid and tipped) 6. Core Drills 7. Solid Chucking Reamers 8. Counterbores, Spotfacers.



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Drill Blanks
up to ½" +.0000", −.0003"
over ½" +.0000", −.0005"

Reamer Blanks
up to ½" +.0002", −.0000"
over ½" +.0005", −.0000"

- Fractional Sizes ¼" thru 1"
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- Complete Sets

Any size from .0135" thru 1.0000"!

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"the reamer specialists"

LAVALLEE & IDE, INC.

CHICOPEE, MASS.

Letters...

To American Machinist
330 W 42nd St, NY 36, N Y

Engineering recruits

Dear Sirs:
I am a student in the faculty of Industrial Engineering in the Technion-Israel Institute of Technology. I am about to graduate with a B.Sc. degree and would like to work and specialize in the United States. I have had that ambition since early childhood, for I was educated in an American grade school.

Having read that American Industry has a great need for engineers, I had the idea of writing to you with the hope that you will give me some advice on how to get in touch with some company willing to give me a contract and, if it is possible, to arrange me a visa. You are certainly in touch with a great many companies and could inquire on my behalf. I am willing also to advertise in some industrial journal in the same sense.

It seems so very obvious to me, you see, for there is American Industry lacking enough engineers, and here I am, a young and very eager engineer, willing to work there. All there is between is formalities and red tape that I don't know how to cope with. Your advice will be most welcome and, needless to say, of very great importance to my future.

S. Benjoseph
Tel Aviv, Israel

Unfortunately, this column is not in a position to operate as a coordinator between employers and position-seekers, but we have published this letter, because it illustrates the international interest in American technical opportunities—Ed.

Stripper design

Dear Sirs:
In the article, "How to Design Strippers," by J R Paquin, a formula is given for finding the stripping pressure (*AM*—Apr 22 '57, p145).

I am wondering how the constant "855" was arrived at. Since there is a definite relationship between the stripping pressure and the clearance of the punch

SHOPMATES

N. Jarvis

"NOW THESE PRINTS ARE 5 TO 1 !! WE WANT A MODEL 3/4 TO 1 TO USE AS A PATTERN FOR THE 3 TO 1 ... AH... YOU'LL ...ER... HAVE TO ADD 1/10 OF 1% FOR SHRINKAGE ... ETC ...ETC!! BLA BLA ...ADDENDUM ...."!
SPROINGGGG...
THE ONLY INTELLIGENT THING THEY CAN DO NOW IS TELL HIM THEY NO SAYVY EENGLIS!!!
IT COULD BE WORSE ... HE COULD'A BROUGHT OUT THE BLACK BOARD HE LAID IT OUT ON!!
N. JARVIS

ON PARTS LIKE THESE---

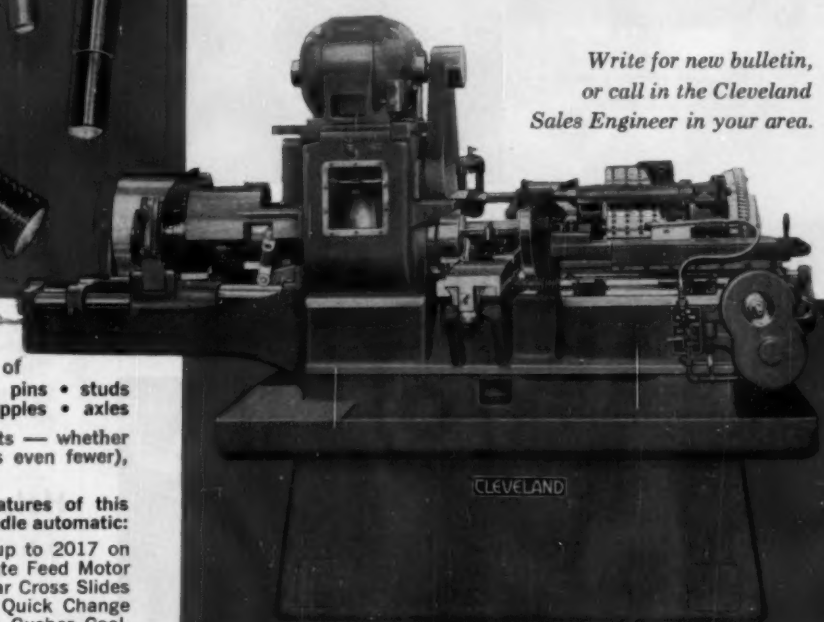
keep your costs DOWN with the NEW model B

CLEVELAND

On jobs that require turning and forming multiple diameters, shoulders and tapers, you can count on your Model B Cleveland Single Spindle Automatics to give you lowest machining costs. One end working tool can be mounted on the milling slide and, by adding hopper magazine, second operation work, such as threading other ends of studs, can be performed. In many cases, parts which otherwise would require multi-machine processing can be *made complete* on the highly versatile Cleveland.

The NEW Model B's are *faster,* too . . . with many design improvements and new features that give you new performance potential. They are fast-cycling, quick and easy to set up, fully automatic . . . ideally suited for both short and long run jobs.

Write for new bulletin, or call in the Cleveland Sales Engineer in your area.



New Model B Clevelands are built in 1⅝" and 2½" capacities; also available to handle 18" work lengths.

Use YOUR New Model B

for fast, economical production of

armature shafts • arbors • pins • studs • transmission shafts • nipples • axles

and countless other similar parts — whether you need 50 pieces (sometimes even fewer), or thousands.

Here are some of the new features of this versatile and practical single spindle automatic:

Increased Spindle Speeds (up to 2017 on the 1⅝" machine) • Separate Feed Motor • Independent Front and Rear Cross Slides • Quick-set Stock Feed • Quick Change Collet and Feedshell Pads • Gusher Coolant Pump • Automatic Lubrication

EXTRA Accessories Include Cross Slide Turning Attachment, Hopper Magazine, Independent Cut-off Attachment, Automatic Bar Loader.

Remember, CLEVELANDS CUT COSTS!

THE CLEVELAND AUTOMATIC MACHINE COMPANY

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Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Horizontal Die Casting Machines

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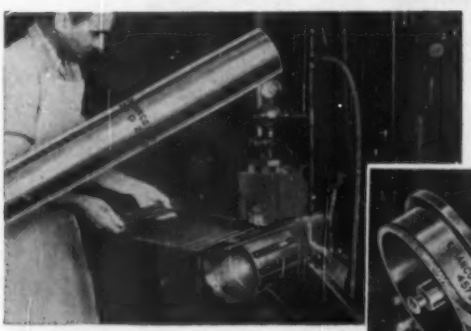
How Singer marks best with Noblewest

For over half a century, Noblewest has been supply leaders of industry—such as the Singer Manufacturing Company—with precision marking equipment. Singer uses every basic type of Noblewest Roll-O-Matic marking machine to identify each component with the Singer inscription and part number. For faster, money-saving marking in your plant, contact Noble & Westbrook Mfg. Co., 17 Westbrook Street, East Hartford 8, Connecticut.

←**SERIES 50** — Noblewest general purpose marking machine with full pneumatic operation. Can be tooled for marking flat and round surfaces, for precision graduating and for serial numbering with Noblewest automatic numbering heads.

SERIES 20 — This rapid precision marking→ machine will permanently mark up to 5,000 pieces per hour. Ideal for parts that will stand up and rotate on the carrier dial. Three interchangeable pressure dials mark approximately 50 different parts on this one Noblewest machine.



←**SERIES 19** — Has production of 6,000 pieces per hour. The die holder on this model has automatic pressure compensator for insuring uniform depth of markings regardless of slight variation of part sizes.

SERIES 21—A Noblewest rapid production→ marking machine with a capacity of 2500 to 3500 pieces per hour. Ideal for parts on which markings must be accurately positioned.

and die, I would be inclined to think that this would necessitate a clearance of 0.010 to 0.015 in.

On all dies used in our plant we never go over 0.005-in. total clearance. These dies are usually designed for long runs at high speed, and mostly using coil stock. We use a constant of 3500 when calculating our stripping pressure. On a recent survey of a number of plants, it was found that the average constant was 2500. The 3500 figure is given by Hinman in his book, *Pressworking of Metals.*

Any information as to how Mr Paquin arrived at his figure will be greatly appreciated.

R M Spaulding
Senior Die Designer, Delco Radio Div of General Motors Corp, Kokomo, Ind

Mr Paquin's answer follows:

The disagreement is understandable in view of the fact that so many variables are involved. However, I feel that Hinman's constant of 3500 is far too high for normal work—and so is 2500.

My "855" constant was derived from the following formula, reported in my article, "Selection of Stripper Springs" (*AM*—Dec 18 '47, p153):

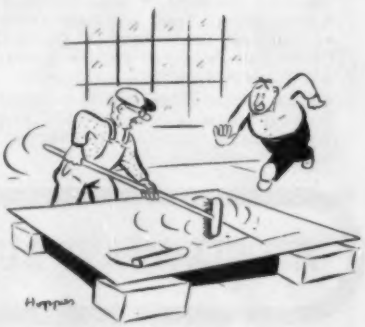
$$P = \frac{L \times T}{.00117}$$

I have used this formula for years with good results and have included it in the Die Design Course which I wrote for Northeastern Technical Institute. Never once have I heard a word of complaint as a result of its use—so would assume it to be accurate.

Still, I would be very much interested in reading a report of stripping tests performed under

Helpful Henry

by L. Hoppes



"Little chalk lines on this plate here,—I cleaned 'em off for you!"

laboratory test conditions. This would be a good project for someone having the facilities.

J R Paquin
Worcester, Mass

In view of the wide difference in the amount of stripping pressure used by different die engineers, we would be pleased to collect and compile any and all comments on this factor—Ed.

Bedaux for costs?

Dear Sirs:
I read with interest the article entitled "Which Method to Report Shop Costs?" by Mr Pilson W Kelly (*AM*—June 3 '57, p109).

I have had contact with the Bedaux system in setting incentive piece rates, but, although I have just completed a night-school course in cost accounting at Northwestern University, I have heard no mention of its use, or even possible use, in that field.

Any information you or Mr Kelly could give me as to where I can get detailed information on the use of the Bedaux system as a cost accounting tool would be greatly appreciated.

Fred T Armstrong
Chicago, Ill

We have acted as middleman on this question and forwarded it to Mr Kelly, whose answer is as follows:

Mr Armstrong's request for references to information on Bedaux Cost Systems presents a difficulty, because there is very little in print on the subject.

However, a Bedaux Cost System can be built from the fundamentals stated in my article when the local climate includes these conditions:

1. A strong heritage of time study.
2. Products of sufficient identity to make time study meaningful.
3. An accurate, quick-acting estimating force.
4. Direct responsibility to top management.
5. Operation by engineers with a knowledge of accounting, or accountants thoroughly accustomed to working with engineers.
6. The realization that a cost system worth having is going to cost some money.
7. A bold, practical, experienced, resourceful thinker in command.

Pilson W Kelly
Brooklyn, N Y

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Have Threads
Rolled Exclusively on
REED
MACHINES

COMPLETELY AUTOMATIC
Reed machines roll threads on the thin wall of spark plug shells with electrode already welded in place. Threads must be square with shoulder on part.

Rolled threads are superior. They are uniformly accurate, smooth and stronger—also more economical to produce.

Reed machines, used for both thread and form rolling, are made in 2 die horizontal and 3 die vertical and horizontal types for infeed or thru-feed rolling. They are rugged, of compact construction, easy to set up, convenient and simple to operate.

Equipped for manual, semiautomatic or fully automatic feeding, Reed machines are suitable for both small job lots and large production runs.

Write for Thread and Form Rolling Bulletin

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Specialists in Thread and Form Rolling Tools and Equipment
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More SPEED..

All these modern Monarchs have what it takes— in speed, range and power.

Why pay for 100% of a lathe — then use only 60 to 75% of its productivity? That's what happens when you operate under less than optimum turning conditions. These are achieved, principally, by utilizing correct feeds, speeds, and tooling. And machinability tests keep proving the value, under many conditions, of working at higher and higher speeds.

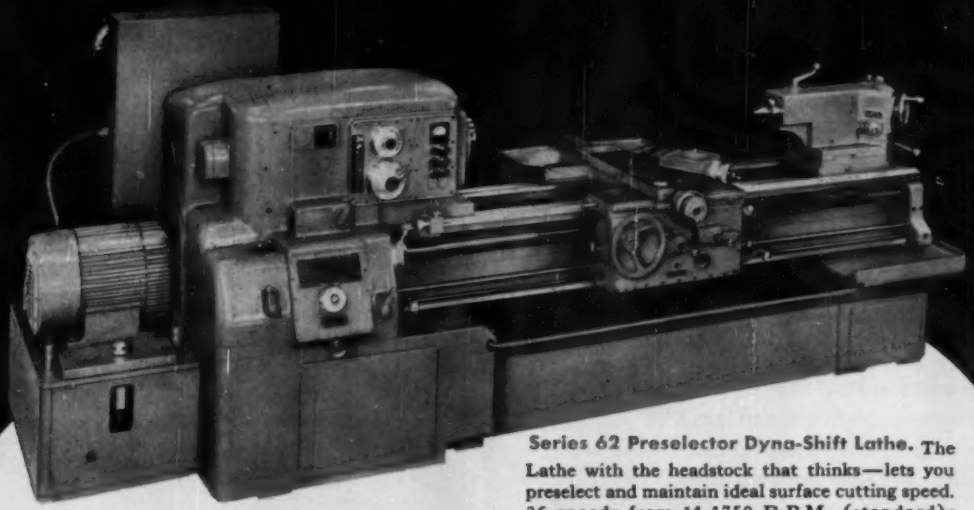
High-speed turning can lower cycle time, improve finish, afford a higher degree of accuracy, reduce work distortion and economical tool life can still be obtained. It's an absolute prerequisite for realizing the fullest advantage from high crater-resistant carbide and ceramic tools. So if you don't use it on all jobs, you still want it available when needed.

In other words, don't buy a lathe for high speed alone. But, considering how often you will need this feature for top performance, don't buy a lathe without it. These Monarch Lathes are high speed machines..... **The Monarch Machine Tool Company, Sidney, Ohio.**

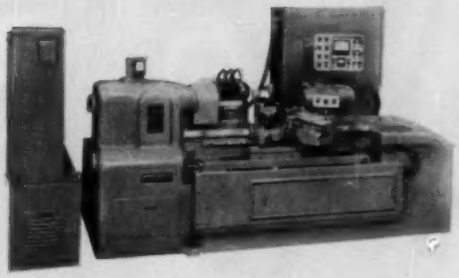
Monarch
ACCURACY • ECONOMY • LONG LIFE
TURNING MACHINES

FOR A BETTER TURN FASTER ...TURN TO MONARCH

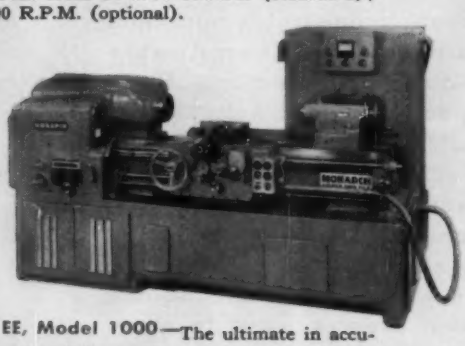
. . . for *full* productivity



Series 62 Preselector Dyna-Shift Lathe. The Lathe with the headstock that thinks—lets you preselect and maintain ideal surface cutting speed. 36 speeds from 14-1750 R.P.M. (standard); 25-2500 R.P.M. (optional).

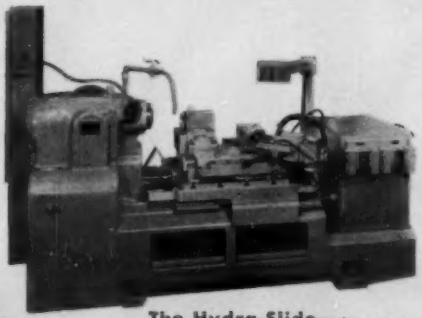


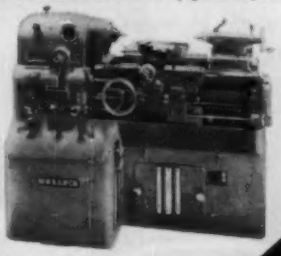
The Mona-Matic. A fast, flexible Air-Gage Tracer controlled, automatic cycle lathe for maximum productivity. Three models; one with constant surface cutting speed. Any one of three ranges between 87-3000 R.P.M. or 160-2760 R.P.M.



Series EE, Model 1000—The ultimate in accuracy, speed and time-saving convenience, whether used for production or toolroom. Four infinitely variable speed ranges; speed 25-2000 R.P.M.

10" Model EE—Sensitive Precision Toolmaker's Lathe and Precision Manufacturing Lathe Models. Infinitely variable speeds from 5-3000 R.P.M. (standard) or from 6.5-4000 R.P.M. (optional).





The Hydra-Slide—An exceptionally versatile high-production chucking lathe. Fully automatic cycle controls almost any desired combination of 4 hydraulic slide movements. Any one of three ranges from 155-2700 R.P.M.

You get what you want with

DANLY

PRESSES

TOP EXECUTIVES

get the speed they need for "on time" delivery

Danly Presses meet the speed and volume requirements of expanding companies. They run at top stroking speeds around the clock . . . minimize breakdown delays . . . need only minimum maintenance. Even double action types maintain a single action pace, thanks to Danly's controlled stroke slowdown. Special drives allow stroking speed to be increased without exceeding safe drawing speed. No need to "gear down" your line when single and double action presses work together. Danly's faster pace saves important time in any shop.

JUST PRINTED. *New book discusses the effect of modern presses on profits and growth of metal-working companies. Request your copy of "Industry's Wealth-Builders" from DANLY MACHINE SPECIALTIES, INC., 2100 So. Laramie Ave., Chicago 50, Ill.*

DANLY

Spot news...

- **An 8-station, 450-ton deep-drawing transfer press** has been bought from an appliance maker for resale by a syndicate of five dealers—Allied Machinery, MacDell Corp and Martin Engineering of Chicago, A & A Machinery of Long Beach, N Y, and Joseph Hyman & Sons, Philadelphia. This is believed to be the forerunner of other joint purchases of automated equipment, cost of which is so great that a single dealer can't invest in it for stock.

- **A small extrusion press (750 ton rating, 4½-in. capacity and smaller)** is being readied for high production hot-extrusion of stainless steel.

- **The outfit that converted obsolete millers into tracer-control duplicators** for only $15,000 apiece—Los Angeles' Utility Metal Products Inc—took a long chance to do it. The company sank $75,000 into the project, leasing WWII Cincinnati fin millers from the government at $3000 per year each. Now that the initial program has been completed, Utility hopes to get a production contract to redo 123 similar machines for the Air Force.

- **Look for two new guided missiles (5000 of each) to go into production soon.** Subcontracts are being widely let, and quotations are out for machine tools.

- **"No unemployment benefits for IAM members locked out by employers"** is the the new ruling of the California Dept of Employment. Early in July, IAM struck a few member firms of the California Metal Trades Association. In retaliation, CMTA asked the rest of its member plants to shut down, throwing 8000 machinists and 1500 non-machinist union members out of work. Unemployment pay will be granted to employees laid off because there's no work to be done because of the absence of machinists—but only to those who cross the picket lines.

- **Auto companies are now demanding unprecedented finish qualities** in mill products (smoothness of ID in as-drawn hydraulic tubing, for instance) to the point where steel company technicians are revamping current mill practice to achieve the desired finishes.

- **Zero lead error (or at least error measured in mu in.)** is expected to be available for such machine tools as screwcutting lathes. As diffraction-grating monitors the saddle movement, error signal is fed back to magnetostrictive devices that act as hinge restraints on the cutting tool, which is pivoted on the saddle. Signal induces displacement of the tool relative to the saddle, completely canceling inherent errors of the machine tool.

- **Shift from planes to missiles is going to be so tough on subcontractors,** particularly in aircraft-dominated Los Angeles, that many will have to get non-defense work or go under. Two things are responsible: (1) most missile money will go into precision-engineered "black box" electronics; and (2) airframe primes are forced to pull more subcontracts back into their own plants.

- **Another $600 million may be trimmed from the defense budget** as Secretary Wilson goes out in a wave of cost-cutting. Hanging by a thread are the lives of the Army's intermediate range Jupiter and Air Force's Thor missiles.

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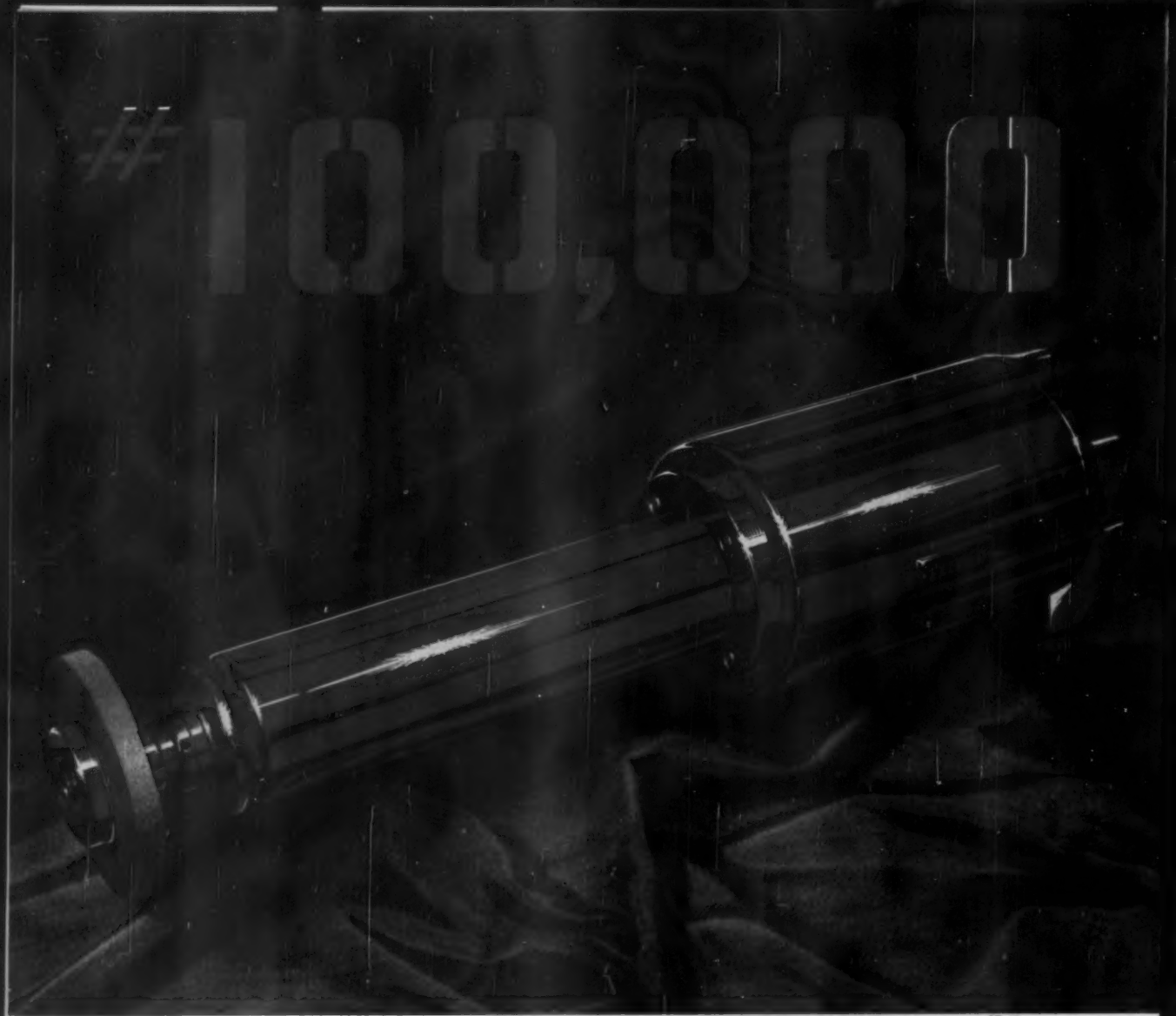

57-49

Proof of Precision: This 100,000th Spindle

. . . that's right. Ex-Cell-O has produced more than 100,000 precision grinding and boring spindles. They are in use today throughout the world, on a wide variety of important jobs. No other spindle manufacturer has so solid a record for satisfaction—so sound a reputation for building the best.

EX-CELL-O FOR PRECISION XLO

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

Machinery Division

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • TORQUE ACTUATORS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

Washington ... NEWS REPORT

Military budget squeeze...

The final version of the fiscal 1958 Defense Dept appropriation, which suffered more than the usual Congressional pulling and hauling that affects military budgets, plays up the bind in which the administration finds itself on defense money. And it underscores the reason for the new round of cancellations, cutbacks, and postponements hitting military production.

Congress finally voted $33.7 billion in new funds for military functions (excluding construction). This sum is $2.3 billion under the administration's original fiscal 1958 appropriation requests. For procurement and production and research and development, the cuts are relatively small.

This is the rundown:

- **Air Force received $5.8 billion** for aircraft and related procurement—$314 million less than was requested and $1 billion under last year's appropriation.

For other hardware procurement, $1.1 billion was voted, the same as last year but $54 million less than the original request. The R&D appropriation came to $661 million, the same as the request, and $49 million less than last year.

- **Army received no new funds** for production and procurement—the program is still to be financed under carryover money. The administration originally asked for $583 million—the first new money request in four years, and the House initially voted $67 million, which the Senate killed. A $400-million R&D sum was voted, the same as sought and $10 million under last year.

- **Navy got $1.8 billion for aircraft** and related buying—$95 million less than requested and $100 million more than last year; $1.5 billion for shipbuilding, about $100 million less than asked and about the same over last year's appropriation; and $164 million for ordnance equipment, $3 million less than this year's request and about $1 million over last year. The sum for R&D is $505 million, just what was requested and $13 million over last year.

The bind this puts the administration in is this: while the level of appropriations is coming down (last year's appropriation was $900 million more than this), the expenditure level is steadily rising (up $2 billion this year from last).

And most observers—particularly military partisans—feel that the administration has accentuated the problem with its on-again, off-again approach to Congress in seeking new funds.

Simplified patents...

Senator Joseph C O'Mahoney (D, Wyo) is spearheading another effort to help metalworking producers and other industries trim the costs of their patent operations. As chairman of the Senate Patents Subcommittee, O'Mahoney has introduced a new bill to allow companies to publish descriptions of their inventions without going through the complex and costly procedures needed to obtain a full-dress patent.

Publication—a form of registration with the Patent Office—is designed to cut down on the number of patents sought by industry for purely "defensive" purposes. For instance, the Patent Office figures that about two-thirds of the inventions patented by large companies are taken out without any intention of bringing the invention to market. But unless the inventor takes out a patent, a competitor may come along later and patent the same idea, thereby foreclosing the original inventor from using the idea.

The huge volume of "defensive" patents taken as a result, says O'Mahoney, imposes a wasteful burden on industry and on the Patent Office. His Publication Bill would handle the situation by protecting the original inventor.

Previous publication bills foundered over protests that they were too loosely drawn, that they would result in a flood of registrations of vague, unpatentable ideas that would fail in court to block a competitor's later patent application. O'Mahoney says the new bill meets this objection by requiring the published description to adhere to "standards of invention" long used in applying for full-fledged patents.

Labor splits ahead...

Jimmy Hoffa, who is certain to become the new head of the powerful Teamsters Union, is already spearheading a new fight between the building trades and the industrial unions.

He's already using his new power to resist efforts to create a new formula for settling jurisdictional disputes between craft and industrial unions.

The scheme calls for teams of investigators—representing both sides—to go to plants to settle disputes on the spot. But Hoffa has gotten the building trades officials to resist putting the program into effect.

Behind the scenes is a running battle between AFL-CIO President George Meany and Hoffa, which may go to a real showdown. There's every prospect that Hoffa's conduct will force Meany and his allies to read the Teamsters out of the AFL-CIO.

PRECISION PERFORMANCE...

To the mint, precision performance means reproducing in finest detail the design intricacies of the various coin denominations.

To tap users, precision performance means production-line continuity, better threaded parts, increased tap life . . . and BAY STATE!

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Bay State Tap & Die Company

Mansfield, Massachusetts

On the nearby shelves of your Industrial Supply Distributor

Detroit ... NEWS REPORT

The foreign invasion ...

Despite well-publicized plans of two of the Big Three to market cars produced by their European subsidiaries, sober Detroiters feel that the U S auto industry is still too ostrich-like in its attitude toward the growing market penetration by foreign "economy" cars.

Even the State of Michigan, which from time to time gets worried about seasonal auto layoffs, gloomily put its official seal to predictions that imports may well hit 500,000 a year by 1958.

Should this prove to be true (we think it's about half right), Detroit is in for serious trouble. If this year's proven foreign car market penetration were added to the anticipated 6.2-million home-grown total—200,000 units to 6.2-million units adds up to the second best year in auto history, instead of the third.

Auto people, from GM's Curtice to UAW's Reuther, know darn well that foreign car sales contribute practically nothing to U S economy.

Yet, as in the case of station wagon inroads on other body shapes, no Detroit statistician has yet figured out who's stealing what from whom. Is it the $1500 used car bracket? Most of the foreign imports deliver at about this price. Or is it the home-grown economy car such as Stude's Scotsman?

The basic problem is multi-headed. First, if Detroit were to come out with a true economy car to match the imports (each of the Big Three has one on the drawing boards), tooling costs, based on 500,000-unit projected annual volume, would be absolutely prohibitive. Besides the body, such a car would require a totally new engine, even totally new wheels.

Second, material costs do not decrease proportionately with the size of the car.

Third, manhours required to manufacture a Volkswagen are about the same as those for a Chevvy. Here the big difference is that a skilled German, Frenchman, Italian or what-have-you gets at most a buck an hour.

Somebody's got to find the answer soon. Detroit, traditionally a plugger for free trade, seemingly isn't worried enough by current import figures to do something about it. But Detroit is concerned, however, with increasing public demand for cheaper-to-operate autos. But until such time as gas prices shoot up 20¢ a gallon (and there's no chance of that in the foreseeable future), it looks like Detroit's Era of Indecision will stay around for quite a spell.

A quick look at production ...

. . . as summer reaches its height, shows GM, Ford and Chrysler all working five-day straight-time weeks. Chevrolet, with 138,000 July-built cars, was the industry's top producer.

As you read this, some 3000 Edsels are already under wraps in dealers' showrooms. Partially because of Edsel's need for Lincoln's Wayne, Mich, facility, 1957 Lincoln production dribbled to a close July 22 with assembly of car number 41,123—about 9000 less than the 1956 model run and a long way under 1949's record 73,507 units. Lincoln's two main problems have been a move to a new plant and changeover to unitized body construction. But '58 models are already coming off the line in pilot quantities.

Studebaker-Packard is still turning out about 1400 units a week, although the 10,000th (and last) 1957 Scotsman has already been built. Public demand for the Scotsman has admittedly been underestimated greatly—although public reception still hasn't been adequate, seemingly, to cause others to plunge into the market.

Over at American Motors, production is stilled, with changeover following a two-week vacation. The first AMC '58 will be out late in August.

Station wagon volume grows ...

Nowadays, any housewife with two or more kids feels she's got to join the Station Wagon Set. And that's why Ford General Manager J O. Wright predicts a million of them will be sold in 1958—and that's 40% more than in 1956.

Of this total, Ford expects to get 41%, and Mercury expects a big share, too.

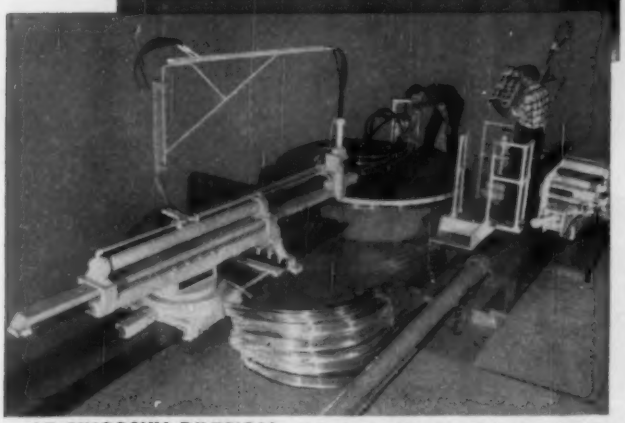
Chevrolet figures 16% of its total sales will be in station wagons this year, looks forward to 25% three to five years from now. Plymouth thinks 20% of its sales will be in station wagons next year. And American Motors, which leads the industry with 60% of its output devoted to the station wagon, expects to up this percentage next year—if only because its "senior" lines, Nash and Hudson, will offer them, too.

Just what it is the station wagon replaces is a problem that puzzles Detroit statisticians and market analysts. Is it the 2-door or 4-door sedan of the same make and model, or is it the cheapest model in the next highest bracket? The auto industry suspects it's the latter—the cheapest model in the next highest bracket—that's suffering serious inroads from the station wagon buyers. And maybe that's why the medium-priced car is the "toughest sell" in autos today.

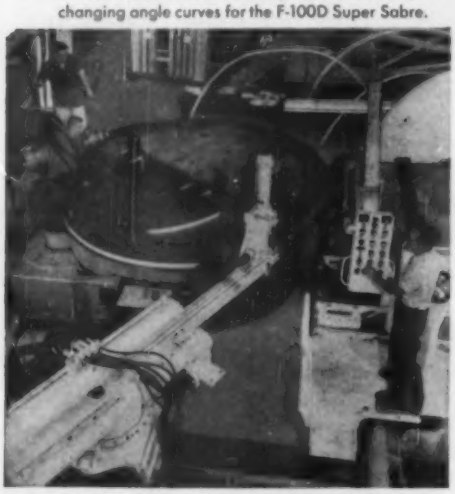
Producibility DOES Up

WITH BATH RADIAL DRAW FORMERS

AT NORTH AMERICAN, Columbus, Model CF 25 Bath Radial Draw Former produces a variety of changing angle curves for the F-100D Super Sabre.



AT SIKORSKY DIVISION, United Aircraft, this 12-½ Ton Bath Radial Draw Former produces accurate curved parts for military and commercial series helicopters.



AT RYAN, Bath CF 25-35 turns out fuselage sections for jet tanker and jet transports as well as an accelerated output of jet engine parts.

In forming the difficult curves and tough metals for modern high speed designs . . . in aircraft, jet and missile production . . . where producibility really counts, more and more parts are being formed on Bath Radial Draw Formers.

The combined stretch and compression methods of Bath Radial Draw Forming yield accurate cross section and contour in curved parts. Radial Draw Forming offers one piece construction in complicated parts, accuracy in the formed piece that eliminates subsequent machining operations and bends up to a full 360° of curvature.

Ask for our new Catalog CF 856 describing Bath Radial Draw Formers or Catalog 32310 describing the parts forming facilities of our Contract Forming Division.

AT NORTH AMERICAN, Los Angeles, one of a battery of Bath Radial Draw Formers which are producing airframe and missile components.

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Aircraft and Missiles...

NEWS REPORT

A slight tightening of belts...

The aircraft industry is frankly edgy over recent defense cutbacks, and over the prospect of more. But defense cutbacks or no, the aircraft and missile outlook in most key areas is still a healthy one. Take, for instance, Los Angeles:

• **Douglas Aircraft,** with a current $2-billion-plus backlog that's half military and half commercial, felt the budget axe early. Back in March, Douglas learned there would be no production contract forthcoming for the C-132 transport. Then, two months ago, production was washed out on the F5D Navy jet interceptor. But still in production at Douglas are B-66 series bombers, C-133 transports, the Navy's F4D, A4D, and A3D. Along with that, Douglas has enough orders for commercial DC-6s and DC-7s to carry through next year. Too, production is building up at the new Long Beach, Calif, plant for the DC-8 jet transport.

And Douglas's missile work is increasing—not decreasing. Now in production, or in the "high-level development" stage, are the Nike-Hercules, Nike-Ajax, Genie, Honest John and Thor.

Overall, Douglas prospects seem to be on a fairly even keel, despite a moderate anticipated shrinkage. The F4D will phase out before long, but increased DC-8 output will take up much of the slack. Total Douglas employment is around 80,000 today, 3000 under six-months-ago levels. Look for employment to drop at a rate of 2% or so a month for the rest of this year—which won't mean firings, just no replacement of normal turnover.

• **Lockheed's backlog is good, too**—$1.4 billion at midyear, about the same as a year ago but down from $1.6 billion at 1956's end.

Lockheed's F-104 is one of the latest cuts announced by the Air Force (same number of planes but deliveries spread over a longer period). While this won't mean a cut in production rates, it does mean that the rate won't be built up to anticipated levels. Also affected by recent cutbacks: **T-33 and T2V1 trainers.**

Currently, about 40% of Lockheed's backlog is commercial. Now in production are 1649A Skyliners, and the 1049Gs and Hs. Coming on is the Electra propjet.

Lockheed missile sales will run around $75 million this year, could easily double in the next couple of years. The company has some 17 projects in various stages of development. Most advanced: the X-7 ramjet test missile, the X-17 three-stage ballistic test missile, and the Navy's intermediate-range ballistic Polaris.

Lockheed employment has been shrinking gradually, will probably be down 10% by year's end. But as in Douglas's case, there won't be any layoffs—just no replacement of normal turnover.

• **Northrop** is the only Los Angeles area airframe maker to get a fat contract recently. North American's ill wind blew good for Northrop when the Air Force chose to retain Northrop's Snark over North American's Navaho. Both are air-breathing intercontinental cruise missiles.

With about 7800 people under contract to the Snark, Northrop employment has jumped by 2000 since the first of the year to 23,000.

Other major jobs going on at Northrop include F-89 jet modifications (another $6.9 million has just been awarded for this), a major subcontract job for Raytheon on the Army's ground-to-air Hawk missile, and development of the T-38 supersonic base trainer for the Air Force.

North American, most diversified of U S airframe makers, is still very much in business in spite of the Navaho cancellation and an earlier Air Force decision against a production contract for the F-107. So, even if the Navaho layoffs do total 15,600 by year's end, North American will still employ 35,000 in the Los Angeles area.

And the original Navaho layoff estimate has now been knocked down to 12,000. It may drop still further if rumored missile contracts materialize. While the only production contract on hand at NAA's Los Angeles Division is the soon-to-close-out F-100 Super Sabre, the Division has development contracts on two new weapons systems. And at NAA's Columbus, Ohio, Division, some 17,780 workers are building T-2 trainers and JF Furys.

Texas feels the pinch...

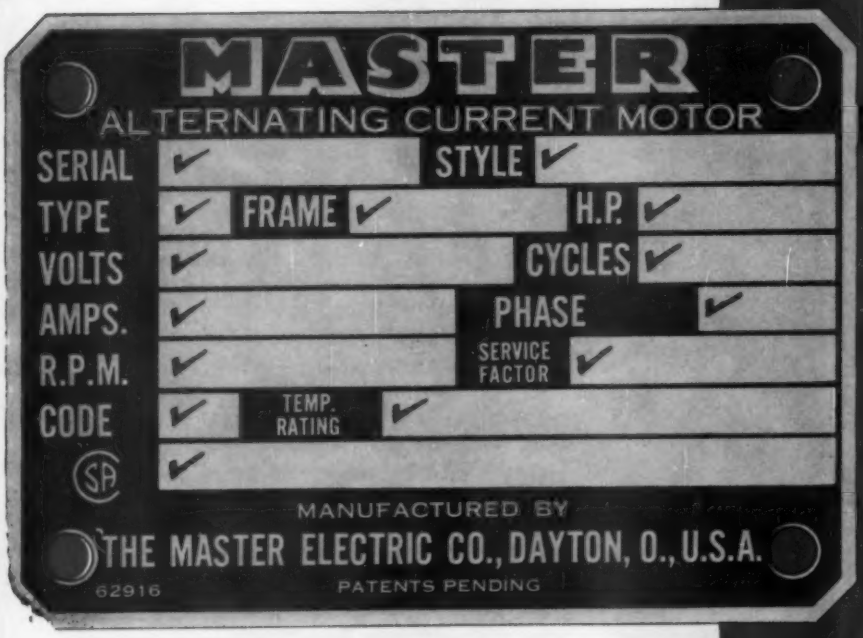
Defense cutbacks are having a noticeable effect on aircraft employment in the Ft Worth-Dallas area. Convair Ft Worth, for instance, has cut its work force by about 1000 in the last month—but it still has 2000 more employees than last year, although there'll be more cutbacks among shop personnel by year's end.

Bell has laid off about 500 since the first of the year and further "not drastic" workforce cutbacks will continue—they'll be in engineering, management and production people.

Chance Vought's workforce, because of the Crusader and Regulus II programs, is pretty stable.

Temco's workforce has lessened somewhat in the last few months, although employment is still 6% or so ahead of last year (10,300 people).

Write your own ticket—



What are your power drive requirements? Here at Master, with the widest selection in the nation to choose from, you're sure to fill your needs quickest and best.

Need something special in gear reduction—electric brakes—variable speed operation—fluid drive or special mounting? Or would some of our standard models (⅛ to 400 H.P.) fill the bill? You'll find the answer here! And remember, all Master components are engineered to form combinations of units in one streamlined, compact package of efficiency. Name your need and the name that fills it is Master—for greater salability of motor driven products; for increased productivity of plant equipment.

Motor Ratings..⅛ to 400 H.P. All phases, voltages and frequencies.

Motor Types.....Squirrel cage, slip ring, synchronous, repulsion-start induction, capacitor, direct current.

Construction ....Open, enclosed, splash-proof, fan-cooled, explosion-proof, special purpose.

Speeds .....Single speed, multi-speed, and variable speed.

Installation .....Horizontal or vertical, with or without flanges and other features.

Power Drive Features .....Electric brakes (2 types)— 5 types of gear reduction up to 432 to 1 ratio. Mechanically and electronically-controlled variable speed units—fluid drives—every type of mounting.

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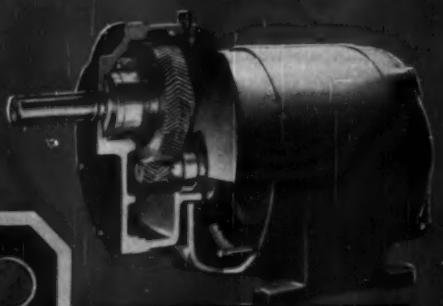
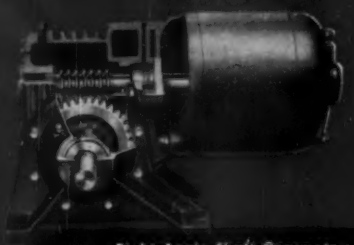
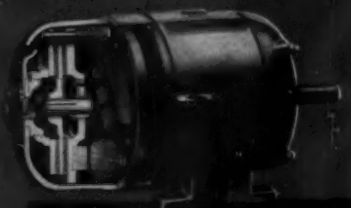
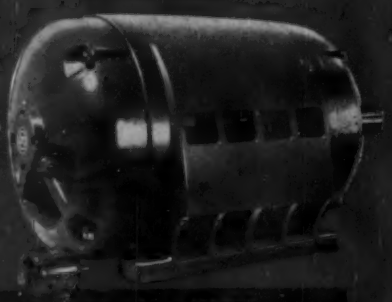

Parallel Shaft Gearmotors


Right-Angle Shaft Gearmotors


Unibrake Motors

Speedrangers


Standard Motors — ⅛ to 400 H.P.

Machine tools ... NEWS REPORT

How many surplus machines? . . .

A lot of talk is going the rounds about large quantities of government-owned machine tools that might be thrown on the market for sale because of sharp cutbacks in the defense program and because of the shift from airplanes to missiles. Added dependence in the future upon nuclear weapons as opposed to conventional weapons also is a factor.

The whipping up of alarm over the possibilities inherent in the situation seems a little premature, according to the facts at hand.

First of all, the Defense Department has not yet computed the amount of production equipment needed to fulfill weapon requirements based on the new concept of the next war. The extent of surplus machines cannot be determined until then. The needs obviously will be less than now; but the big question is: How much less?

After the actual number of surplus machines has been decided upon, the question is how much impact their sale on the open market will have on the machine tool industry.

Surplus sales can be spread . . .

In case surplus machine sales would have a severely adverse effect upon the fortunes of machine tool builders, government officials are authorized to spread the offerings over a long enough time that any harmful results would be minimized. This kind of sensible handling is made possible by what is known as the Honeywell—Drake agreement.

This informal agreement was arrived at by the Business and Defense Services Administration, Department of Commerce, and Pentagon.

Inspection teams determine what the impact on the machine tool industry will be. These teams are comprised of representatives of the armed services, machine tool builders, machine tool distributors, and users. Team head is from BDSA's Metalworking Equipment Division.

BDSA's Harry Hawkins has just headed a team that inspected more than 1000 machine tools to be offered for sale from the Air Force's O'Hare Field at Chicago. The team has found that these machines will not have any harmful effect on the machine tool industry because almost all of them are 15 years old or older, or are highly special machines.

It is believed that the present round of selling of government machines will extend over the next six to nine months, since the prescribed routine takes that long.

The number to be offered may total 4000 to 5000 machines. Few of them are expected to be in competition with new machine tool sales.

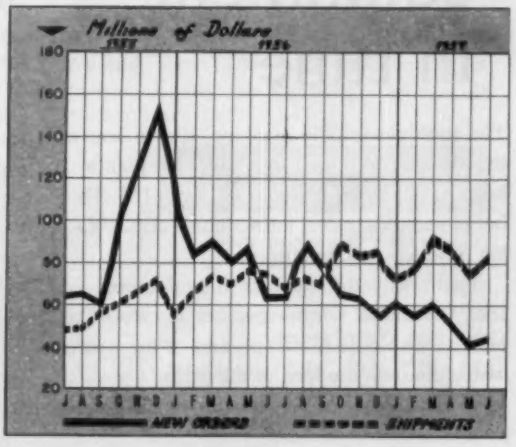
HPM buys Henry & Wright . . .

Hydraulic Press Mfg Co, division of Koering Co, maker of hydraulic presses, is entering the mechanical press field by purchase of the Henry & Wright Division of Emhart Mfg Co at a reported price in excess of $1.2 million.

Henry & Wright will operate as a department of HPM. Moving of the physical inventory from Hartford, Conn, to Mount Gilead, Ohio, will be completed by September 1, HPM's president William H Bennett estimates. Henry & Wright builds a dieing machine—a high-speed, precision mechanical press—in capacities up to 500 tons.

Natco machines made in Canada . . .

Natco machines for sale in Canada and for export from Canada are being built by R McDougall Co Ltd, Galt, Ontario, the ownership of which has just been acquired by Upton Bradeen & James Ltd, well-known Canadian distributor of machine tools. The fact is that McDougall has been manufacturing Natco machines for the past year.



Slight rise in both new orders and shipments of machine tools for the month of June was recorded on the National Machine Tool Builders' Association Index. New orders rose from $41.4 million in May to $42.85 million in June. Shipments went from $78.5 million to $83 million at the same time.

Drills 417 holes at one time.

How to keep hydraulic equipment in tune

The multiple-spindle machine, shown above, is used in the production of cast iron harps for pianos. It drills 417 holes at one time—from 5/32″ to 7/16″. The large number of spindles makes lubrication a critical factor in keeping production humming.

That's why the machine manufacturer—Zagar Tool, Inc., Cleveland, Ohio—specifies *Texaco Regal Oil R&O* both as a spindle lubricant, and in the hydraulic system which controls the feed of the drills.

Texaco Regal Oil R&O has much greater oxidation resistance than ordinary turbine-quality oils used in hydraulic service. It effectively prevents rust and foam—assures smoother, more dependable service.

There's a complete line of *Texaco Regal Oils R&O*. Let a Texaco Lubrication Engineer help you select the one best for your job. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

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FOR ALL HYDRAULIC UNITS

What's ahead ... in Metalworking

NEWS REPORT

Fall season looks promising...

There is no sign of any deviation from the very high rate of metalworking production, despite the fact that August "dog-days" are here.

More plant-wide vacation shutdowns occurred in July than this month so that, if anything, August will make a better showing than last month.

The weeks ahead are expected to bring production schedules at least as good as current ones, and probably better. A number of metalworking industries feel that the fall season will see an expansion in their operations.

Stretchout or cancellation of some programs should not obscure the fact that aircraft and missile work will continue at a high rate all year (for details, turn to p91).

Both automobile and appliance makers anticipate good production this fall. Builders of heavy generating equipment and other electrical apparatus will be running at or near capacity.

Machinery orders gain...

McGraw-Hill index of new orders for machinery (except electrical) has risen recently, after seasonal adjustment.

Gains were chalked up in metalworking machinery, engines and turbines, pumps and compressors, and in office equipment. Only in construction and mining machinery, which has not done well all year, and in "other industrial machinery" was a drop recorded.

The index of new contracts for industrial construction is 47% below the level of a year ago.

Material handling equipment makers report a stepup of 19% in dollar volume of orders, according to the Material Handling Institute. Average dollar volume of monthly orders this year is 139.4, with 1954 taken as 100.

Resistance welder manufacturers shipped almost as much the first half of this year as in the same record-breaking period of 1956. They now have a five-months' pileup of orders.

Foundries expect pickup...

Gray iron foundries look for a substantial gain in operations late this month or next. June output was down 15% from the May level, and no improvement has occurred since then.

The feeling is that gray-iron customers are still adjusting their inventories. They also are not doing as big a volume of business as they were a few months ago.

Steel foundry operating rate this month is believed to be back at the June total, after a seasonal slump in July. Business in railroad freight car castings, which is about 40% of the industry's volume, is expected to be good all year.

Steel anticipates bigger demand...

The steel people predict at least a moderate pickup in demand around the middle of October, with November and December being unusually good production months.

All steel items, with the exception of heavy plate, structurals and railroad wheels and axles, are in relatively easy supply. Auto makers will begin placing sheet and strip orders shortly. Warehouse business is seasonally slow, and stocks on hand are high.

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AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

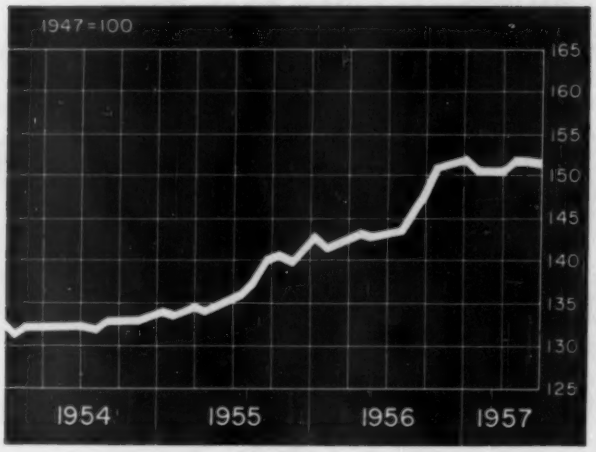
	JULY Estimated	JUNE Preliminary	MAY Revised	JUNE Year Ago
Total Index	**176**	**176**	**175**	**168**
Machinery	**151**	**152**	**149**	
Electrical Machinery	**208**	**199**	**205**	
Autos	**125**	**127**	**110**	
Other Transportation	**370**	**371**	**333**	
Other Metalworking	**146**	**142**	**138**	

NEWS REPORT

What's ahead: . . . in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	JULY Estimated	JUNE Preliminary	MAY Revised	JUNE Year Ago
Total Index	**152.2**	**151.9**	**151.9**	**144.0**
Metalworking Machinery	**176.9**	**176.9**		**165.8**
Other Machinery exc. Electrical	**160.8**	**160.6**		**150.9**
Electrical Machinery	**154.4**	**154.3**		**143.0**
Fabricated Metal Products	**143.2**	**143.3**		**137.5**



Dollar volume to be up from first half...

The level of general business is lower than at any time since the steel strike a year ago. But this fact should not generate pessimism, because much of the easing is traceable to vacation shutdowns by thousands of plants.

Seasonal effects, it is true, are being felt more widely than in several years. Within a few weeks, however, seasonal influences will help to push business up higher.

Nothing has happened lately to change earlier predictions that the volume of business this fall will be large. And chances are that the dollar total may be bigger than in the first half of the year.

Consumers are a little more cautious about spending their money, various surveys show. But the statistics of retail trade do not reflect this conservatism. Department store sales are up 5% from a year ago.

A quick look at the situation reveals that electric power consumption is a whopping 11% above the 1956 rate; carloadings mark up a gain of almost 15%; and bituminous coal output is 11% higher than it was last summer. On the other hand, petroleum production is down 2½%, lumber 11%, heavy construction awards 13%, and paper 13%.

Latest figures make clear that some revised thinking must be done about inventories. Stock on hand increased more in 1956 than estimated. And this year the paring down of inventories has been less than expected.

The consumer continues to be the hero of the U S economy. Whereas industry has cut down to some extent its future commitments for capital goods, the public bought more goods in the second quarter than in the first.

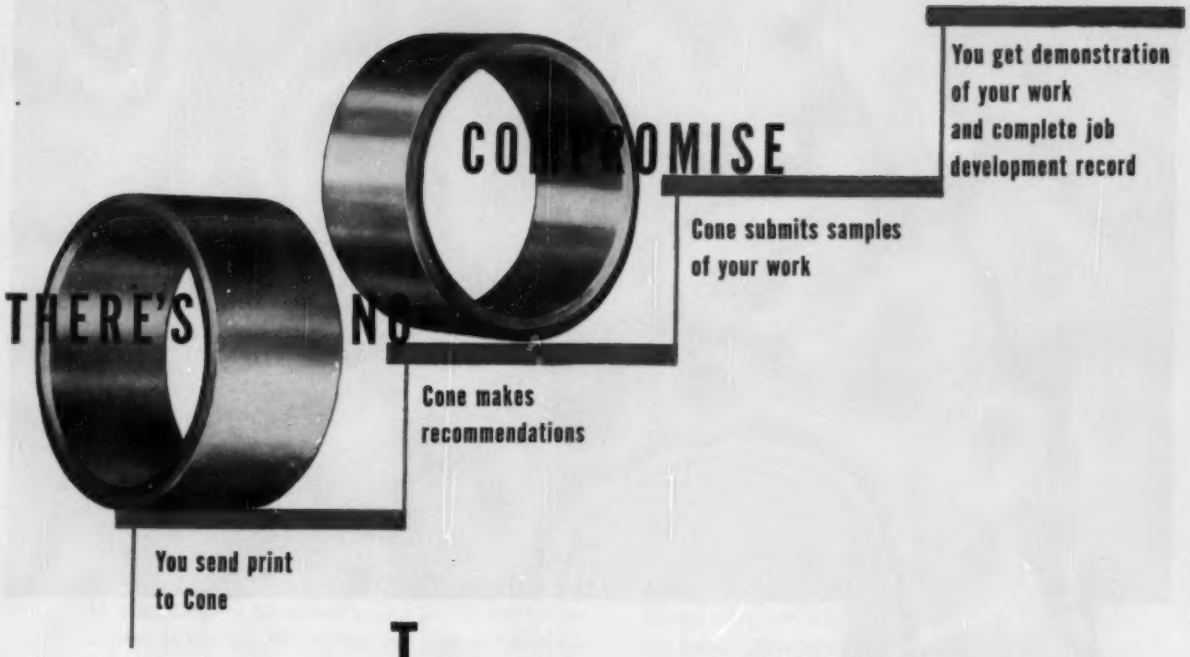
Business spending for new equipment has declined lately for the first time in two years. Government outlays, by contrast, have risen.

WEEKLY BUSINESS INDICATORS	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949=100)*	147.4	147.4	142.6
Steel ingot operation (thousands of tons)	2,103	2,033	415
Electric power output (million Kilowatt hours)	12,243	12,306	11,295
Production of automobiles and trucks	151,189	148,551	144,000
Engineering construction awards (Eng. News-Record—millions)	$401.0	$393.6	$309.5

MONTHLY BUSINESS INDICATORS	Latest Month	Preceding Month	Year Ago
Index of industrial production (1947-1949=100)*	143	143	141
Index of durable manufactures production (1947-1949=100)*	160	159	157
Durable goods manufacturers' sales, millions*	$14,159	$14,159	$13,754
Machinery manufacturers' sales, millions*	$ 3,343	$ 4,197	$ 3,935
Durable goods manufacturers' new orders, millions	$13,746	$13,012	$14,732
Machinery manufacturers' new orders, millions	$ 4,141	$ 3,829	$ 4,460
New contracts for industrial construction (1950=100)	134	143	256
New orders for machinery (except electrical)* (1950=100)	146	143	151

* Seasonally adjusted.

No. 6 in a series


THERE'S NO COMPROMISE
You send print to Cone
Cone makes recommendations
Cone submits samples of your work
You get demonstration of your work and complete job development record

There is no adequate compromise with efficient production practices, if you are in business for a profit.

But you don't always know just how competitively efficient your equipment is. Case histories of what the other fellow is doing are sometimes garbled. At least the poor ones are not advertised. And conditions vary in all plants. Sometimes you have reason to be more concerned with what you don't want in new equipment than with what you do want. Cone believes too much is at stake for a machine to go into a line unequipped for the job, with either carbide or hss tools.

The Conomatic Carbide Development treats each job individually from standpoint of work, machine, tools, and operating personnel.

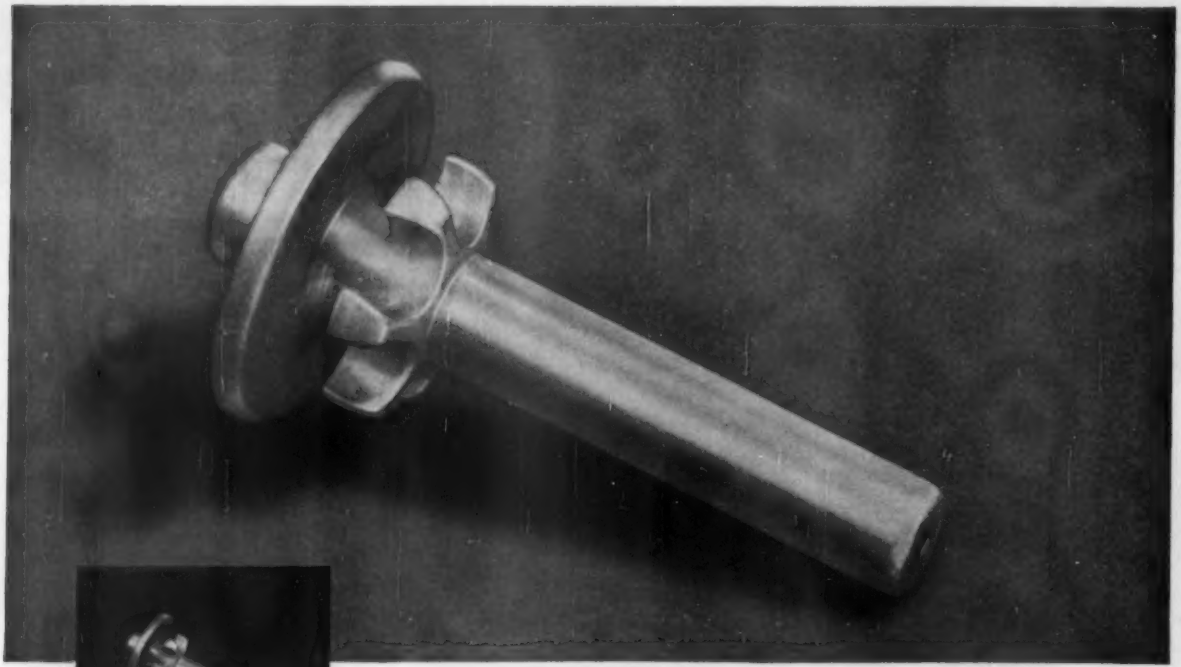
DATA FOR COMPARISON

Part.....Bushing	Length.....⅜"
Machine.....1⅝" Conomatic	Hole Dia.....1¼"
Tools.....100% Carbide Tipped	RPM.....825
Material.....8620	Time.....14.8 Secs.
Stock Size.....1⅝"	

Conomatic

For particulars send for "Four Steps With Cone"

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U.S.A.



Actual Size

Free Machining Stainless Helps Solve Tough Automatic Job

From bar to finished part in only 12 seconds with Type 303 stainless steel. A total of 10 operations are required, including drilling 6 semi-circular holes. Surface finish is held to 20 microinches and tolerances .002" t.i.r.

This small part for a single lever kitchen faucet is typical of the wide variety of screw machine parts being specified in stainless steel. And it is typical of how Armco Free-Machining Stainless Steels can help you turn the toughest jobs into good profit-makers.

Among 33 standard grades of Armco Stainless Steel, there are more than a dozen free-machining grades. For almost any job you can select a free-cutting variety to help you boost production. And the uniform machinability of all Armco Stainless Steels cuts rejects and down time.

Cost-cutting Sizes and Shapes Available

You can make additional savings with Armco Stainless bars because they are available in a wide range of sizes in both standard and special shapes. The size you need and special shapes mean less bar stock to turn into chips . . . even the possibility of eliminating entire operations.

New Machining Film Available

Armco has a new 16 mm sound film that outlines recommended practices for both production and job-shop machining of stainless steel. You'll find a showing of "Machining Stainless Steel" useful in keeping costs down, quality and profits up on stainless jobs. It's available to you free of charge. Just fill out and mail the coupon.

Armco Steel Corporation, 1457 Curtis St., Middletown, Ohio

We would like to show "Machining Stainless Steels" on the following date _____ Alternate dates are _____ or _____

☐ Also send us information on the available sizes, shapes and grades of Armco Stainless Steel bars.

Name_____

Company_____

Street_____

City_____ Zone_____ State_____

Rustless

ARMCO STEEL CORPORATION

1457 CURTIS STREET, MIDDLETOWN, OHIO

SHEFFIELD STEEL DIVISION • ARMCO DRAINAGE & METAL PRODUCTS, INC. • THE ARMCO INTERNATIONAL CORPORATION

ARMCO®

American Machinist

MAGAZINE OF
METALWORKING PRODUCTION • ESTABLISHED 1877

Moonlighting Is One of Them

Moonlighting is not what you may think. It has no relationship to moonshine. It bears no resemblance to what happens when two young people are out on a date. It is slang for having two jobs at one time.

Slim as it may be . . .

the evidence at hand indicates that moonlighting is a growing practice. An increasing number of men are working a substantial number of hours on a second job. As the work-week declines in length, the more moonlighters there are likely to be.

One out of seven men has a second job, a recent Gallup poll shows. The average time on the second job is 20 hours a week. The U. S. Census Bureau found, in a 1956 survey, that around 3.7 million workers had two jobs.

What brings to mind this intriguing subject of moonlighting is the steadily rising clamor among union leaders for a shorter work-week. They would like to reduce the normal working time to four days a week, or a total of 32 hours.

The public is hardly giving . . .

even lukewarm support to the short-work-week proposal, if the Gallup poll is correct. The vote was more than two to one against the plan. And women, most of whom are housewives and would have to work just as long hours as now, are against it by three to one.

Moonlighting is one of the important beneficiaries of the extra-short work-week. For the fact is that many workers, if given a choice between more leisure time and a higher living standard, will pick the latter. That means, in turn, that these workers will go out and get themselves a second job.

That is exactly what lots of rubber workers did when their industry went to a six-hour day. And the practice has persisted in that industry right up to the present time.

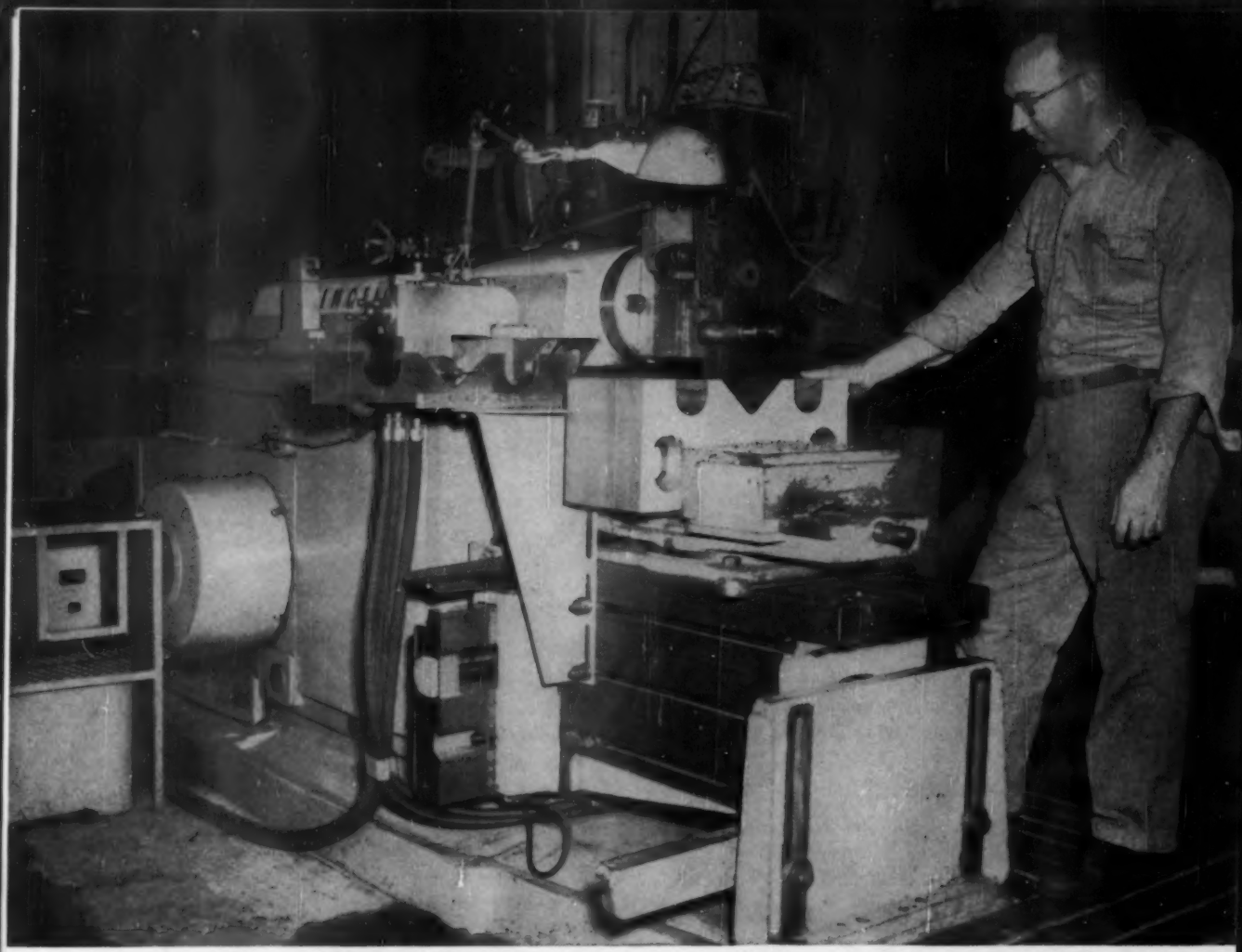
It would be misleading to give the impression that moonlighting is necessarily a dangerous and harmful practice. Yet one should face up to the fact that no employer really likes it, sensing that it has a high potential for trouble.

Whether he realizes it . . .

or not, the moonlighter is apt to be less efficient on both jobs than when he has only one. In addition, he has a divided job interest. His accident rate is likely to show a rising tendency. He probably is harder to live with at home, just because of the cumulative effect of physical and mental fatigue.

To be blunt, moonlighting is a highly undesirable practice when widely indulged in. It is a practice that will be richly nourished by the four-day week. Before the advocates of such a short week blow their trumpets too loud and too long, they should consider carefully the undesirable consequences of their handiwork. Moonlighting is one of them.

Burnham Finney EDITOR



Photograph courtesy of Heppenstall Company, Pittsburgh 1, Pa.

High-alloy shear knives machined on accurate Cincinnati Rigid Shaper...

at HEPPENSTALL COMPANY, Pittsburgh 1, Pa.

This Cincinnati 36" Rigid Shaper, equipped with an automatic contouring unit, is machining high-alloy steel shear knives. These knives will be used to cut 3" round-cornered squared billets and 2½" rounds, by a leading Midwestern drop-forge company.

The heavily ribbed column, extended ram bearing and slot-free ram insure minimum deflection and maximum accuracy. Exclusive Cincinnati 50 psi pressure lubrication is real insurance against wear. The Cincinnati electro-magnetic brake and clutch with finger tip control is positive and trouble free. Faster on the job . . . Easier on the operator.

Write Department A for Bulletin "Cincinnati Rigid Shapers". We also suggest you consult our Application Engineering Department regarding your machining problems.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS · SHEARS · PRESS BRAKES

CINCINNATI

Blued Blanks — by using data from the "Cam Layout Sheet," also templets and levers, for rises, drops and clearances, a cam layout can be produced quickly, Standard blued blanks are laid out in hundredths

American Machinist

"Cam Library" *slashes cost* of screw machine parts

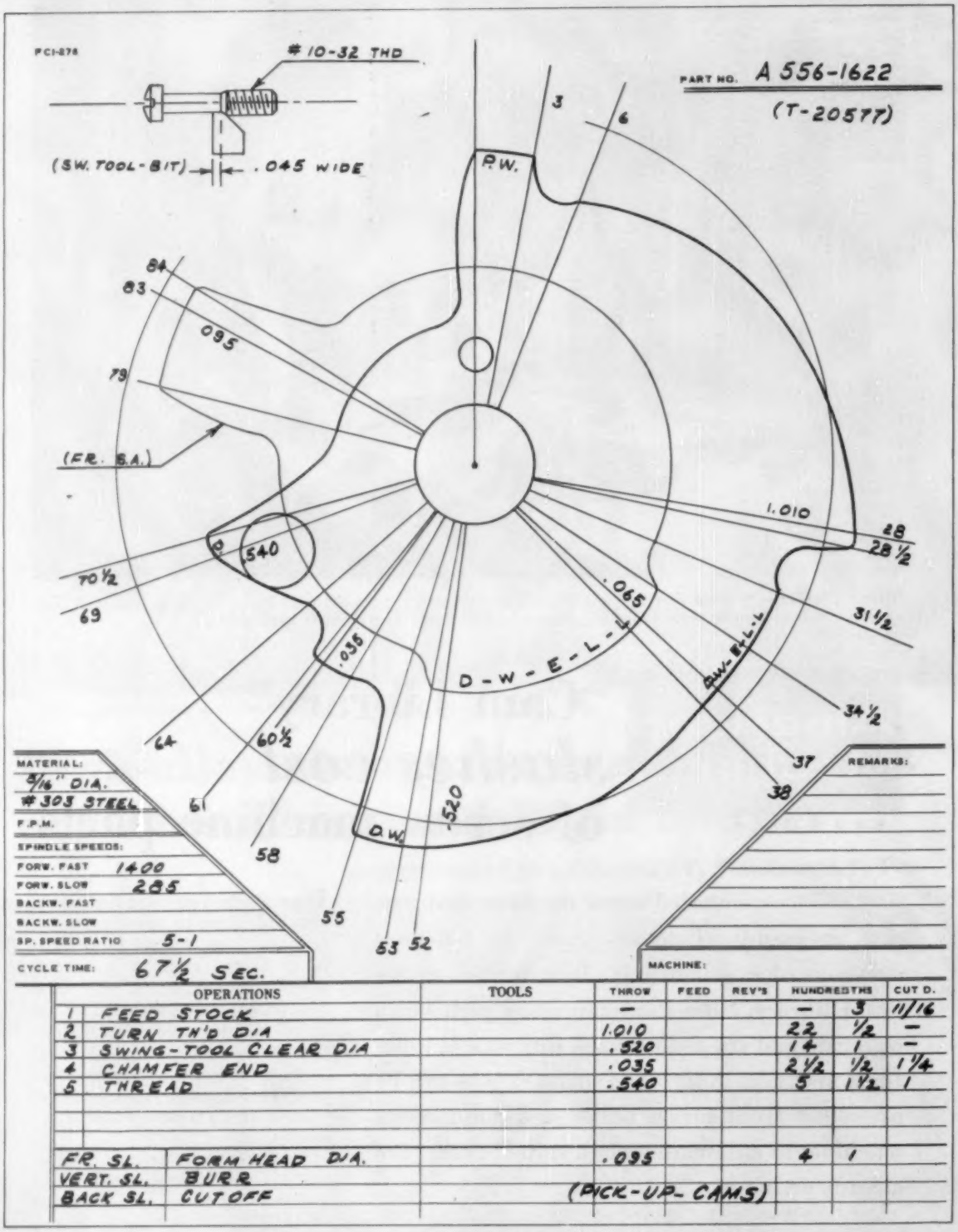
Any efficiency-minded screw machine shop can save thousands of dollars yearly by indexing drawings of existing cams. By reference to the "cam library," the shop can often pick out a lead cam and cross-slide cams with usable lobes for a new job. Additional benefit: jobs can be upgraded from turret lathes and hand screw machines to automatics when suitable cams are already on hand

STEPHEN ERICSON, Manufacturing Engineer
FAIRCHILD CAMERA & INSTRUMENT CORP
SYOSSET, LONG ISLAND, NY

If you study a group of B&S cams, you will begin to see a "pattern" emerge. There will be great similarity among cams for a specific purpose, regardless of the total rise, or tool travel, required for the actual jobs involved. You will see that drill-pullout cams look alike, that thread-chasing cams have their own characteristics, and that cross-slide cams have a family resemblance.

The differences among cams of any specific category lie in tool travel, or total rise, and amount of hundredths of cam space. If you segregate prints of the cam layouts according to type of operations handled, and then arrange these prints in ascending order of tool

"Cam Library" slashes cost . . .



	OPERATIONS	TOOLS	THROW	FEED	REV'S	HUNDREDTHS		CUT D.
1	FEED STOCK		—			—	3	11/16
2	TURN TH'D DIA		1.010			22	½	—
3	SWING-TOOL CLEAR DIA		.520			14	1	—
4	CHAMFER END		.035			2½	½	1¼
5	THREAD		.540			5	1½	1
FR. SL.	FORM HEAD DIA.		.095			4	1	
VERT. SL.	BURR							
BACK SL.	CUTOFF		(PICK-UP CAMS)					

Typical Threading Cam — Threading lobe with 0.540 rise is marked on drawing, and copy of drawing is filed in Cam Book 2—Thread Chasing. When a similar rise is needed for another job, this cam is listed on the Setup Card by tool number and original part number. The setup man then goes to the appropriate cam cabinet in the shop to get the needed cam

travel, you have the beginnings of a "cam system" or library. And when you make the layout for a new cam, you add a print to your index.

ORGANIZATION OF LIBRARY

It will be helpful if cam drawings are prepared on a standardized 8½ x 11-in. sheet, so that they can be filed in ring binders labeled:

Book 1—Drill Pullouts

Book 2—Thread Chasing (Self-opening Diehead)

Book 3—Tapping, or On and Off Threading

Book 4—On and off Turning, or In and Out Boring

Book 5—Nos. 0 to 3 Turret Positions

Book 6—Nos. 4 and 5 Turret Positions

Book 7—No. 6 Turret Position

Book 8—Cross-Slide Cams

Only a very few cams will not fall into one of the above categories. They can be labeled "Specials," and use found for them.

We now have more than 3000 cam layouts in a library such as this. These layouts have been accumulated over the past 16 years. More often than not, we can find a cam in this library to suit a short-run order, avoiding the expense of purchasing or designing a special cam. Time lost in making a cam, or buying one, is also saved.

HOW TO USE CAM LIBRARY

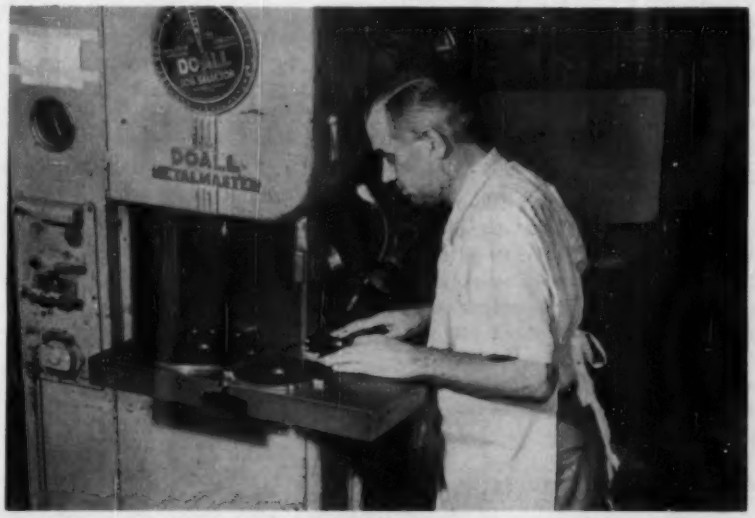
First, we study the part print and decide what operations are required and the size of the automatic screw machine required. If deep-hole drilling is to be done, reference is made to Book 1 for a drill pull-out of proper tool travel. Cam-layout prints are placed in the book, according to length of tool travel; short travel cams in front and longer travel cams in back. The sheets give the spindle speeds and cycle time for the original part, plus other pertinent data.

Cross-slide cams are listed on sheets according to hundredths of cam surface for "Throw" or "Rise", and also according to the fastest cycle time for the cam. Thus, cams can be selected to coincide with the lead cam chosen.

Now, for the job a "Set up Card" is written, giving spindle speeds and cycle time of the cams, the order of operations, the tools used by original part and tool number, etc. A set of "Cam Layout Books" is also kept in the shop.

SIZE OF MACHINE:		PART NO.:					
Size of Stock:		ROUGH SKETCH:					
Type of Material:							
Surface Feet (Approx.):							
Sp. Speed Forw. Fast:							
Sp. Speed Forw. Slow:							
Sp. Speed Backw. Fast:							
Sp. Speed Backw. Slow:							
Ratio of Sp. Speeds:							
R.P.M. of Backshaft:							
Time to Feed St., or I.T.:							
Total Rev's per Piece:							
Time to Make One Piece:							
Gears (Cycle Time):		O.D. OF LEAD CAM BLANK:					
OPERATIONS		THROW	FEED	REV'S	HUND'S	64ths	C-D
Front Slide:							
(Dwell)							
Back Slide:							
(Dwell)							
Vertical Slide:							
(Dwell)							
(SEE OTHER SIDE FOR FURTHER INFORMATION)							

Cam Layout Sheet — Time is saved and mistakes avoided if all data for a new job are systematically listed before cam layout is started. Reverse side of sheet gives information on turret and slide tools

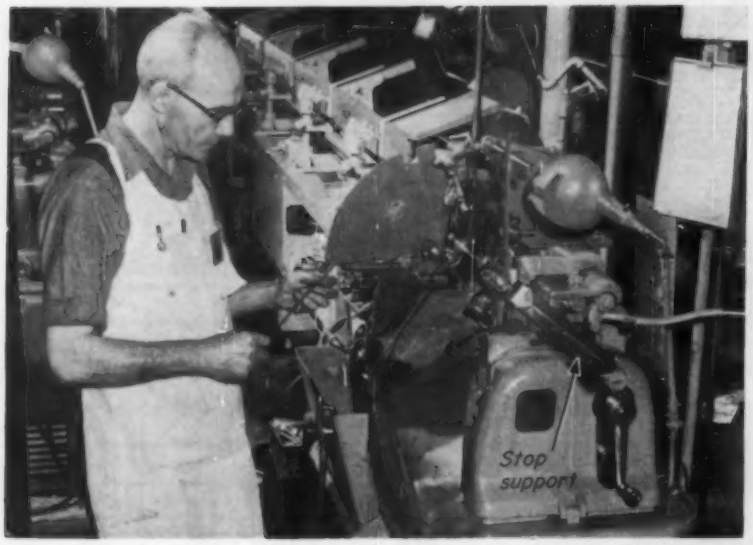


Timesaver — Scribed blanks are quickly bandsawed to about 1/64th in. of the outline in a fraction of the time required to setup and mill a blank on a milling machine

QUICK CAM LAYOUT

There are, of course, many occasions when we must design a new cam. This work is simplified by using a simple 8½ x 11 in. form.

After active revolutions have been established, we determine idle time, such as stock feeding, turret indexing, and necessary clearances. Active revolutions are obtained by dividing the amount of feed per revolution into the amount of figured throw per cam lobe. Whatever the idle time amounts to, the active revolutions are equal to the balance of the number of hundredths of cam surface. Thus, the total equals the amount of revolutions required to manufacture the part. For instance, if the idle time amounts to 20 hundredths of cam surface, and the active revolutions amount to



Turret saved — To machine long shafts, it is common practice to cut out two holes of the turret, to permit parts to fall out after cutting off. Fairchild removes the turret, substitutes a series of stops on angle iron, applies cams designed to operate a steadyrest and lift it out of way at cut off. Further, the shafts had to be fed twice, and a device was designed for rear cross slide to feed part way for forming, before feeding to length. Turret is put back on automatic for other jobs

800, then the 800 revolutions are equal to 80 hundredths, (100 minus 20 idle). Dividing 800 by 80 we get 10 revolutions per one hundreth of cam surface. Multiplying this by 100 we now get 1000 revolutions for the complete cam cycle. If we are using a spindle speed of 1000 rpm, the cycle time amounts to 60 sec. or one minute per piece.

Rather than drawing the outline of the cams on a tracing at this time, it is an easy matter to mark "blued up" cam blanks quickly and efficiently, using the proper templets and levers to suit. In this way the toolmaker can go right ahead with machining the cams and have them ready in a couple of hours or so.

CAM FUNCTIONS CHECKED

After the cams have been cut they can be traced very quickly, using a pencil along the outline of the cams. Draw the lead cam as a heavy outline. Use a thin line for the vertical slide cam, a "dash" line for the front slide and a "dot and dash" for the back slide. In this way with the four cams superimposed on the "zero" line, it is easy to see the outlines of them all and their functions.

If the cams are to be machined by a cam-engineering company, they can work from the work-sheet layout data without making a cam design drawing.

QUICK CAM MAKING

The machining of scribed cam blanks to desired specifications without the use of a milling machine can be done quickly and easily by a skilled toolmaker or machinist. The most important factor is to remove excess material before final filing to size.

The first step is to drill holes at the bottom of each drop of "cam lobe," using same size drill as the diameter of the "cam lever roller" on the particular machine on which these cams are to be used. These sizes are ½ in. for #00, 9/16 in. for #0 and ⅝ in. for #2 machines. The next step is to use a bandsaw to cut away material between the drilled holes, leaving approximately 1/64 in. for finishing. Using a band file or sander, all bumps are removed, being careful not to go below the scribed points on the cam blank. The final step is to clamp the cam in a vise and "draw file" each lobe to an even rise, matching up with each layout point as marked. Complete the cams by using a piece of emery cloth under the file and rub lengthwise on the cam surface to produce a good finish. Both edges of the cams should be chamfered slightly for smoother travel of cam lever rollers, when rotating cams on the machine.

If a "dead-true" dwell is required on a certain section of a cam, such as for swingtool operations, it is a simple matter to "shave" this particular surface on a lathe or milling machine, working from an arbor in the large center hole of the cam.

For rush jobs, cams do not need to be hardened immediately. This can be done at a later date. It is only necessary to touch up the cam surface with a file and emery cloth, caseharden about 0.010 to 0.015 deep and store for future use.

An average set of 4 cams can be machined and ready for use in from 2 to 3 hr.

It is standard practice in our Screw-Machine Dept. to take work from turret lathes and hand screw machines and put the jobs on automatics wherever possible. We can do this by using cams out of our cam library or making cams by our fast method. Two examples will illustrate the savings on second-operation work:

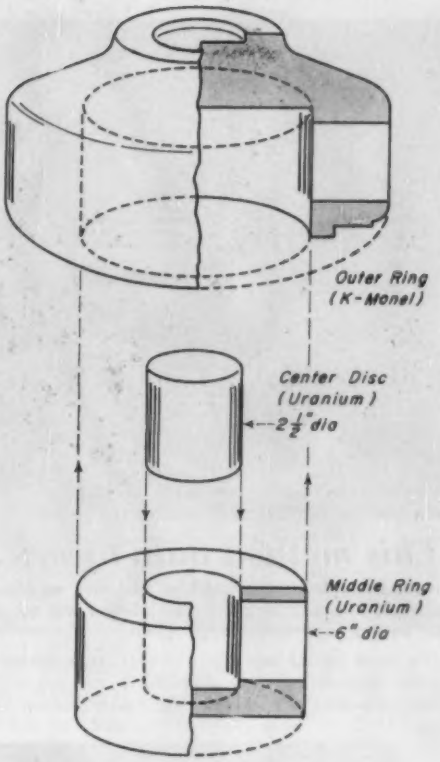
Example 1—Ten years ago we produced a certain contract job at 3.2 hr per 100. Now, the time is 1.8 hr per hundred by the new automatic method.

Example 2—For a first operation, the time was 10.5 hr per 100; for the second operation on a hand screw machine, 9 hr per 100. By upgrading, we cut the time to 8.4 hr per 100 in one operation (on an automatic).

Thus, for 20 hr of engineering and toolwork we were able to save over $3,000 on the parts concerned.

All told, our cam library saves many thousands yearly.

Electrical discharge cuts "impossible" slits



The setup on this issue's cover shows how seven slits, 2 in. high and as narrow as 0.015 in. wide, were machined out of heavy uranium and monel rings. Only one slit was straight through; the other six were tapered wider inside the work. Doing this job by electrical discharge—the only known practical way—involved three problems:

- **How to flush away eroded particles of metal**
- **How to guide long electrodes straight over a long distance**
- **How to form electrodes that would stay straight**

EDWARD J LACH, shop foreman, and CARL MUNTER, instrument maker,
Special Materials Shop, ARGONNE NATIONAL LABORATORY, LEMONT, ILL

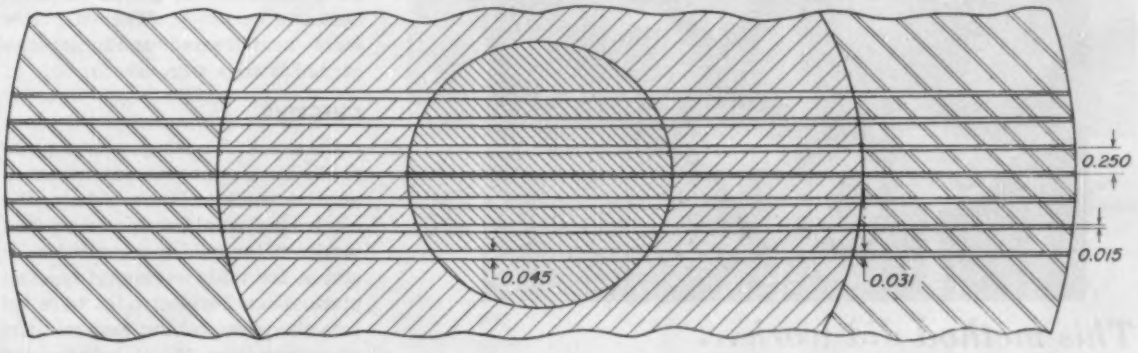
Once we decided to do this job by electrical discharge, we first had to convert the machine to handle the deep feed motion necessary to penetrate the work fully.

We added a servomotor and appropriate gearing to the table leadscrew, and connected to them the regular vertical feed controls. The electrodes were fastened to the spindle by an adapter that clamped them along with spacer blocks between.

Several kinds of guide fixtures were tried out, but the best seemed to be a box section made up of Lucite. It was a good bearing material, machined easily, insulated well, and was stable in the coolant —which was transformer oil. Two horizontal members were grooved accurately to hold the seven electrodes at the specified centerdistances. The guide assembly included spring fingers that held the electrodes all to one side of the grooves, which allowed using several electrode thicknesses without affecting the centerdistances. Thus, different electrodes for roughing and finishing could be applied.

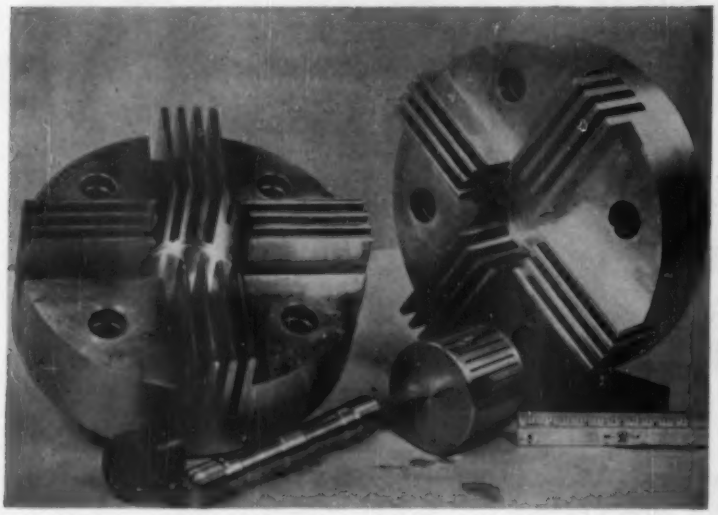
Coolant was brought in by tubing to spray pipes above the elec-

Argonne National Laboratory is operated by the University of Chicago for the U S Atomic Energy Commission.



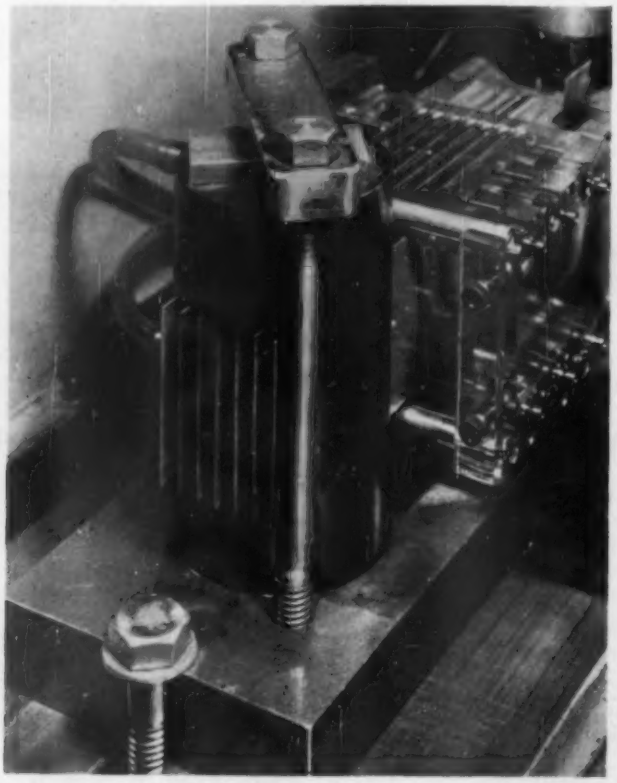
This was the work, a high-speed rotor for neutron research, called a "chopper." OD was 10 in., outer ring was monel, and two inner rings were uranium

Electrical discharge cuts "impossible" slits . . .



This method didn't work...

Rotor was split, and interlocking ribs were machined to fit together, leaving open spaces between to form the slits. Method was not successful because rotor had to be integral to withstand high speeds



This method did work...

Seven yellow-brass electrodes were worked through each rotor section by Elox M-500 machine that was tooled to provide horizontal instead of vertical action. Slits through this center slug were all straight

trodes at the end of the guide fixture, which allowed gravity feed to help wash the coolant into the work holes and to wash out metal particles.

Workpieces were mounted on fixture plates fitted with pins on the underside. These pins fitted snugly in table slots and allowed reversing the work accurately so the electrodes could be inserted in either end of each workpiece. Other stop pins were provided to position the fixture plates to produce the taper inside the slits.

BUILDING ELECTRODES

Electrodes had to be 7 in. long and in several gages from 0.012 to 0.042 in. Thicknesses had to be accurate to 0.0005 in., and flatnesses had to be accurate to 0.002 in. throughout the area of each electrode. Slight and uniform bowing could be eliminated by the spring fingers in the guide fixture.

Several metals were tried, and the best bet seemed to be 65-35 yellow brass. It was easy to work, not expensive, and did not erode too rapidly—about triple the erosion rate of the work when roughing. Best results were had with commercially rolled sheet stock slightly oversize. It was essential not to reduce the thickness by more than 10% because brass work-hardens and warps. The stock was rolled to exact size, then the edges were sheared and machined to required dimensions.

Next we clamped the electrodes between heavy steel plates and heated them to 575 F, holding them at that temperature for four hours, and furnace-cooling them. They were checked and sorted for flatness and accuracy. Warped plates were heat-treated again or discarded if they were too far out.

CHECKING

To check the setup, a test piece of ⅛-in. aluminum was mounted on the machine table where the electrodes would later enter the work. A tongued block fitted a T-slot in the table to support the test plate. Then the electrodes were fed into the plate, taking four minutes of cutting time. Width between the slits produced was checked, and if the plate was OK, it was moved

back 2 in. (total depth of feed for the work) and checked again. If the width of the slits remained the same, the alignment of the electrodes was OK. Electrodes that widened their slits were replaced and the process was repeated until seven acceptable electrodes were found.

When a good test piece was made, saw cuts were taken across top and bottom to produce strips. These were checked to learn the accuracy of the fixture. These steps seem elaborate, but the accuracy required in the work demanded them, and we believe this precision could not have been obtained by any easier method. Accuracy of the slits machined in the work was to 0.001 in. throughout the length of each slot.

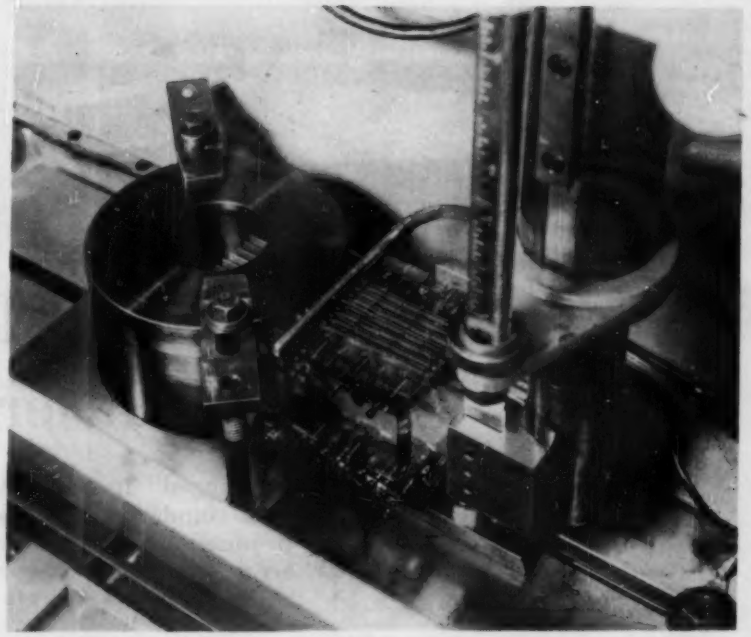
PRODUCTION

Several passes were made with finishing electrodes to size the slots. The central rotor section, illustrated on the cover, was cut by making a pass of less than required thickness, then reversing the fixture and work 180° and making a finishing pass. Measuring the slits indicated the amount of lateral work-fixture movement necessary to bring the slots to full width.

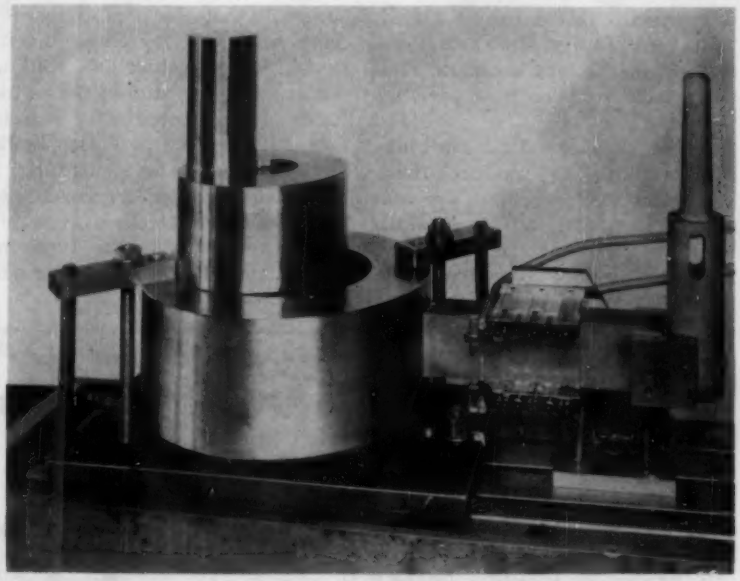
The intermediate and outer rings were tapered by making rough and finish passes parallel to one side of the tapered slits. Then the work was indexed to a stop pin to bring the other side of the taper parallel to the electrodes, and another pair of passes was made to complete the cutouts.

Power settings were 25 v, 35 a for roughing, and 20 v, 15 a for finishing Most of the machining was done around the clock with automatic shutoff switches installed to trip in case of malfunctions or when a pass was completed. At times the machine ran 72 hr without an attendant. The only machine downtime necessary was for changing electrodes or for making test runs to prove accuracy.

Even narrower slits can probably be machined with this kind of setup. The main limitation seems to be that time and cost increase exponentially as slit size decreases. In this case, costs were justified by the important nature of the work.



Middle ring was machined same way. Guide fixture was Lucite, fitted with springs to hold the electrodes against one side of clearance slots for consistent accuracy. Coolant-electrolyte was piped to two pierced tubes mounted horizontally above and below electrodes at front end of guide block



Three parts of the rotor were machined individually, depending on fixture location and electrode alignment to insure slot alignment after assembly. Machine spindle was fitted with adapter block to hold electrodes between spacers. Support below spindle held up guide block

"Building-Block" machines mill "barbered" fittings

B D SHEPHERD,
general supervisor, Tool Design,
Los Angeles Division,
NORTH AMERICAN AVIATION, INC.

"Packaged" tracer-controlled milling heads, combined with standardized bases and suitable fixtures, increase production, minimize setups and inaccuracies, cut down scrap sharply. Such combinations can be used by small shops as well as aircraft plants. Re-use value is high

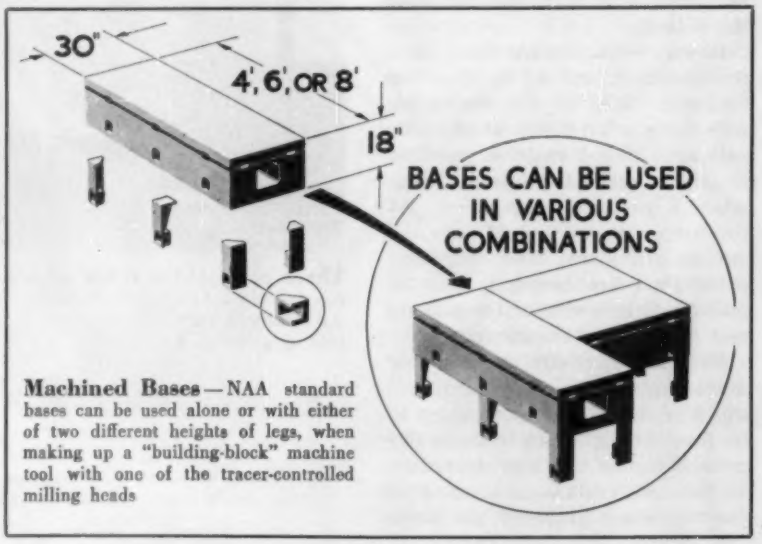
Aircraft weight is a critical design problem. One result of efforts to improve strength and reduce weight is the use of highly "barbered" fittings and skins. Most aircraft plants lack adequate machine tools to make these parts on a production basis.

To be sure, standard machines are available to produce these parts. But such machines are relatively wasteful of time, skill, manpower and material handling, and they produce excessive scrap. Special-purpose machines are undesirable in cost and delivery time. Our ability in 1955 to produce milled skins was not a major problem. But fittings and ribs seemed definitely headed in the direction of the gag-man's idea of engineering perfection—that of being impossible to make at all.

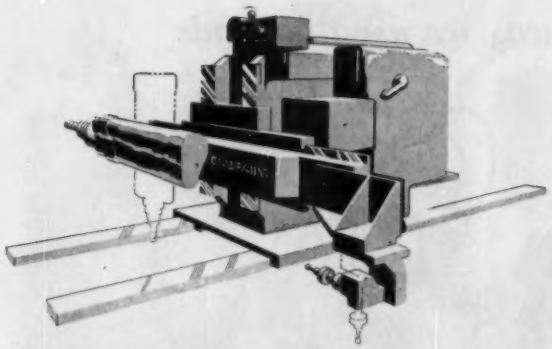
As one reflects, he recognizes that certain basic elements are present in a machine tool, whether it be standard or special. Thus, we can make up the necessary tools and meet our quality standards, our cost and tooling-time goals, provided that certain mechanisms can be purchased as "off-the-shelf packages." By standardizing the bases, risers, angle plates, etc, we can save time and money and use the various elements over and over in various combinations, to suit many different needs.

It was apparent from a study of our parts that the greatest immediate need was for three-dimensional, tracer-controlled milling devices. Further study gave us the limits of practicability for current and future needs. These limits were converted to specifications, and likely manufacturers were invited to bid. The discussions included reference to the types of cuts, material and tolerances expected. Typical examples of these parts are illustrated. Although one of these parts is now a precision forging, considerable machining must still be done. Originally, it, like the others, was machined all over to control weight and stress requirements.

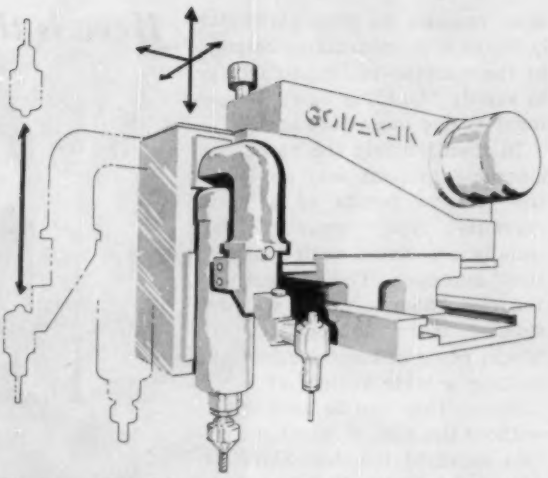
The aircraft industry has only limited capacity to produce large precision forgings. In many instances, the number of pieces on a contract makes it impractical to order forgings of any type. For



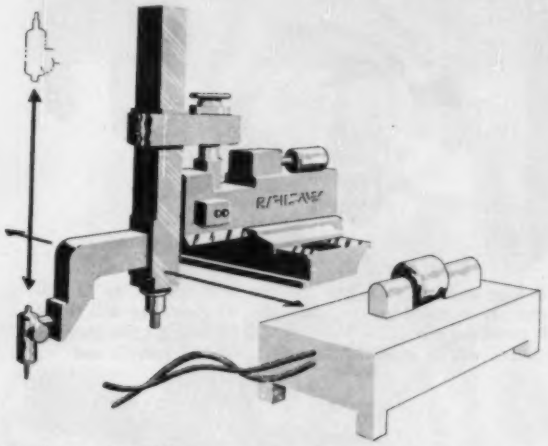
Machined Bases—NAA standard bases can be used alone or with either of two different heights of legs, when making up a "building-block" machine tool with one of the tracer-controlled milling heads



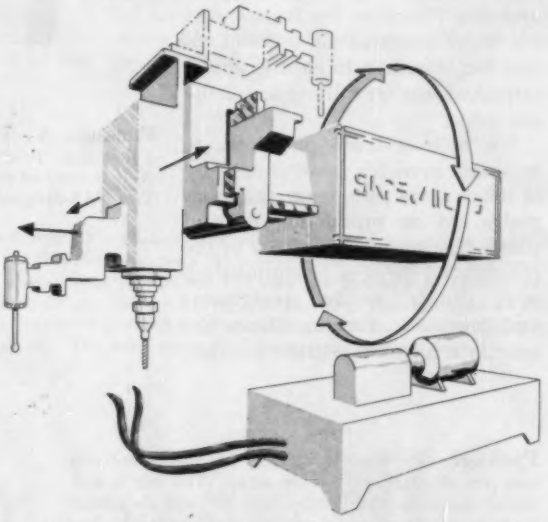
Package A—2½-hp. Work capacity: 8 x 12 in. by any length. Medium-size unit features servo-controlled longitudinal travel of any practical length



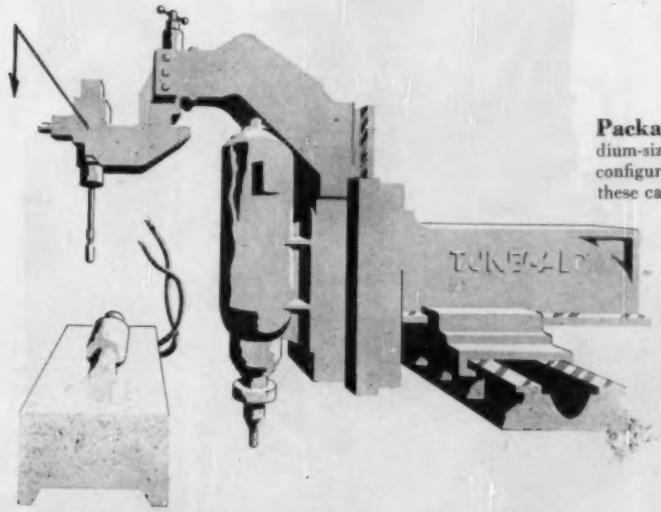
Package B—3-hp. Work capacity: 8 x 12 x 12 in. Considerable versatility is secured in tracer and spindle arrangements. One unit was set up on spar mill to make complex cuts to relieve floor-to-floor bottleneck



Package C—3-hp. Work capacity: 8 x 12 x 18 in. Medium-size unit with separate power supply. Follower-cutter combinations are versatile



Package D—5 hp. Work capacity: 8 x 12 x 12 in. Medium-size unit with integral power supply. Good tracer-cutter configuration: box body attachable by any of four sides, and these can support pattern



Package E—10 hp. Work capacity: 12 x 12 x 24 in. Heavy unit with separate power supply; useful for heavy cuts which all shops get

"Packaged" Milling Heads — By working with machine tool builders, five selections were made for 3-dimensional, tracer-controlled milling heads to be mounted on the standardized machine bases. All units must operate in any position

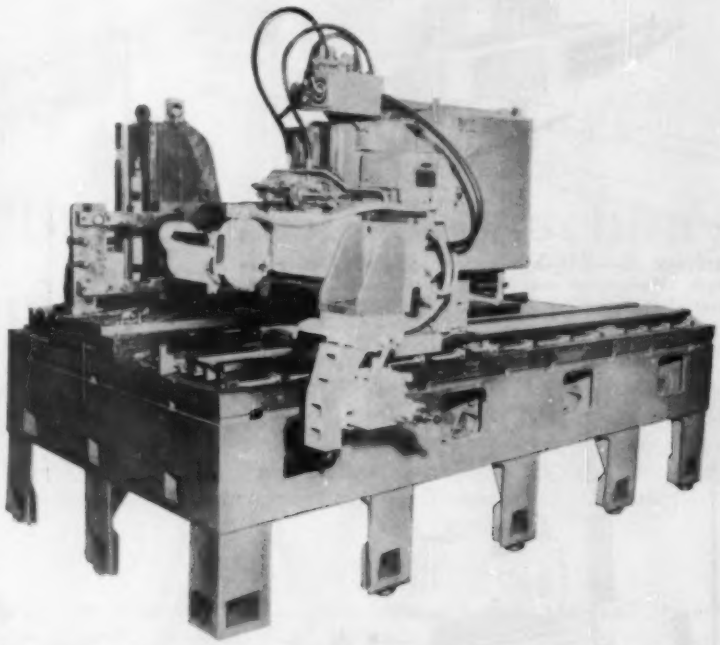
these reasons, we were particularly happy with enthusiastic response by the machine-tool manufacturers to supply "building block" equipment in five basic packages.

In standardizing the bases, considerable thought was applied to the relative merits of a nested "domino" type, versus the type usually associated with "automation" approach. For our purposes, the cast "domino" type was considered more appropriate. The blocks come in three lengths, permitting a wide variety of combinations. They can be used with or without the legs, of which we have two standard lengths. Skirts and cover plates are also stock items. Risers, sine and angle plates allow tremendous versatility.

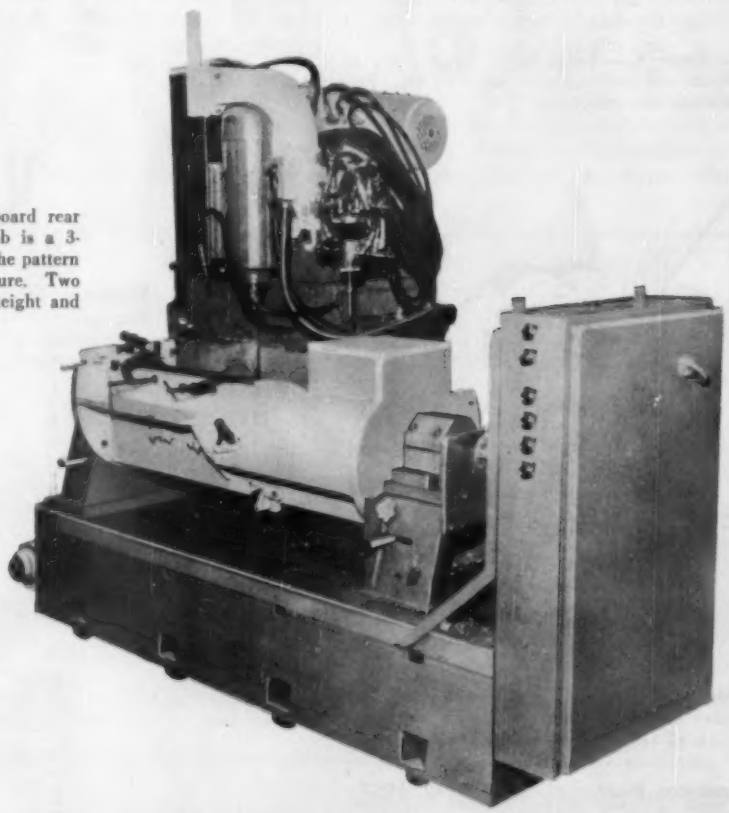
Our job is only beginning. For example, we have designed a 360° tracer-controlled package that will probably follow in the footsteps of the three-dimensional units. It is also our intention to go into applications of smaller milling and drilling units.

We believe these principles to be sound even for small shops, say of 100 or more employees, that normally bid on production runs of parts. The utilization of any of the commercial devices in conjunction with simple, welded positioners and ingenious fixtures places the user in a fine competitive position.

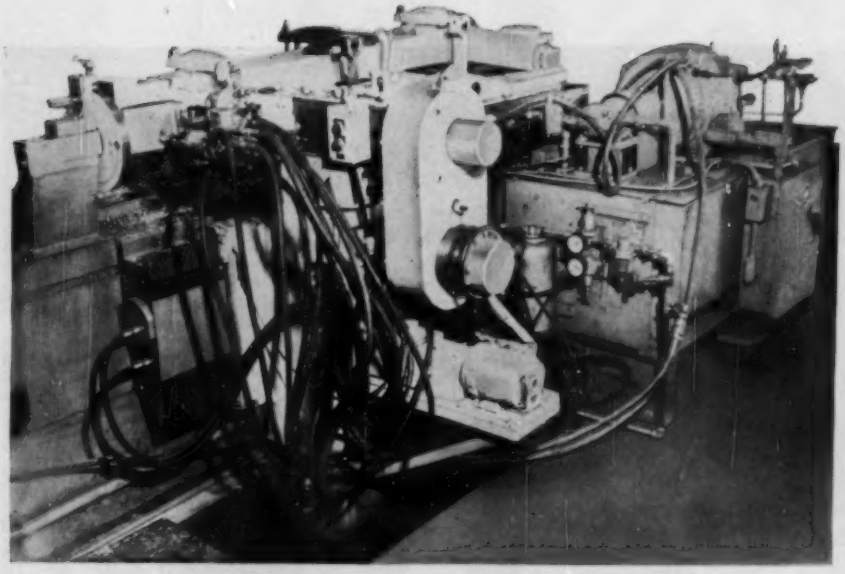
Here is the way we use the heads



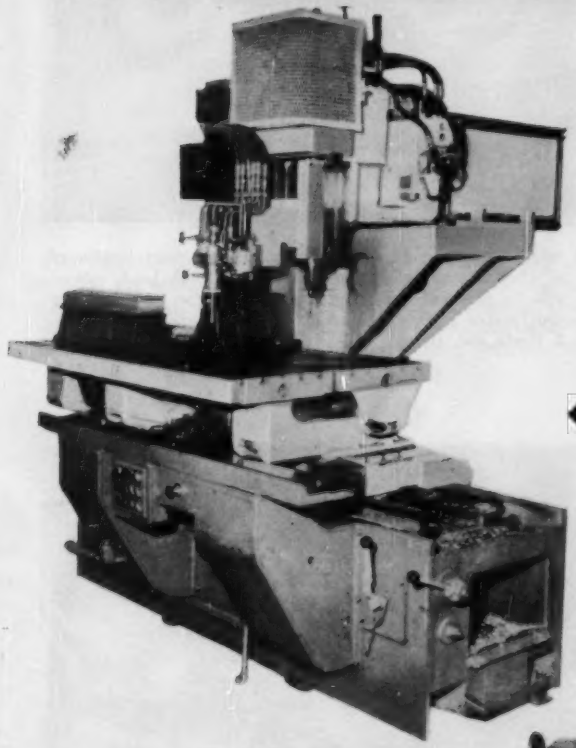
Package A— Four 8-ft base units on long legs and the head are set up to mill a rear spar. Profile patterns are mounted on the near side. The carriage will travel 10 ft in contrast to a 21-ft travel for a machine tool that can be used for the purpose. Two NAA-designed 360° heads will be mounted horizontally at the root-rib end



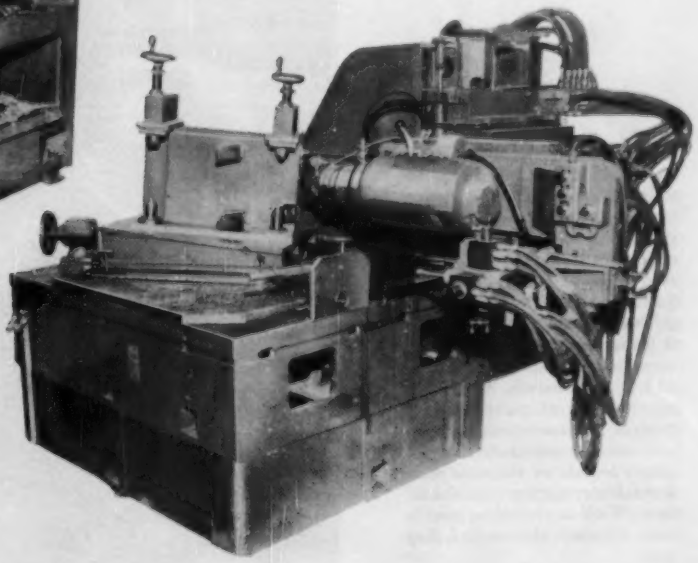
Package B — Critical surfaces on an inboard rear spar are all machined in one setup. The job is a 3-station operation; the fixture rotates 90°, and the pattern is part of the movable portion of the fixture. Two base units without legs provide proper work height and area for the equipment



Package C — Two package units are employed—one on each side—to "blend" previously made cuts on the wing-skin surface of a root The fixture moves longitudinally in respect to three indexed pattern positions. For this kind of work the "C" package is well suited, because it incorporates a variable-speed fluid motor. Two 8-ft base units, on long legs, are placed end to end

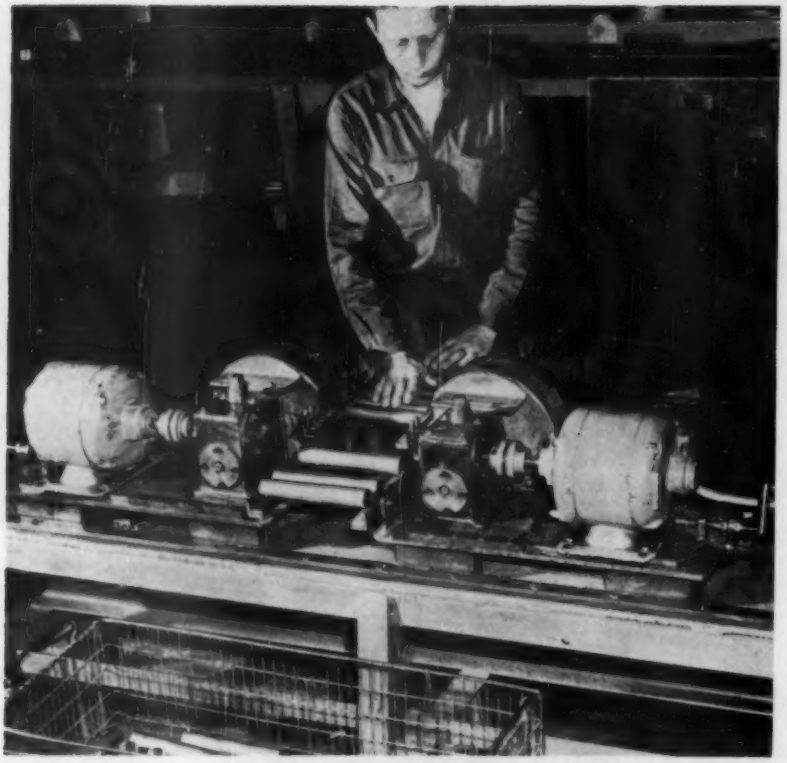


Package D — Considerable use was made of a standard machine tool, in this instance. Note the twin subtable arrangement supporting the pattern and workpiece. The two are mounted in tandem and rock in unison, through use of a profile bar. This construction permits consistent tracer-controlled cutting of a difficult configuration on a root rib. The setup saves much manpower, minimizes scrap

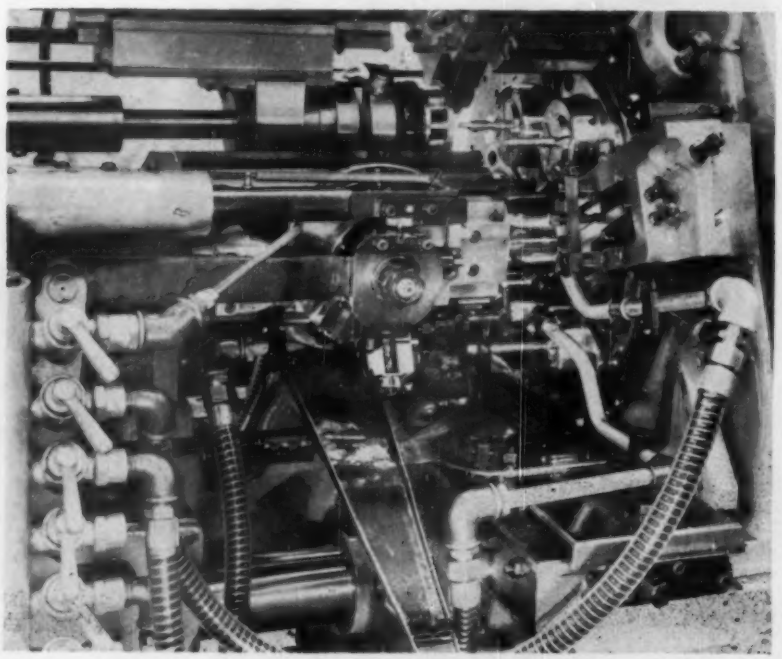


Package E — Nine detail cuts are made on a front-spar segment. The transmission, motor-spindle combination is useful here to provide the wide range of spindle speeds and feeds required. Cutter sizes range from 1-in. end mills to 11 x ⅝-in. slotting cutters. The setup consists of two 6-ft base units, side by side, and one 4-ft base unit, all mounted on long legs. On top is the index finger mounted on a scuff plate. Originally the work was done in a multiple-operation, low-production manner. Conversion cost involved only the fixture adapter, scuff plate, pattern holder and welded column mounting for the package

talented tooling

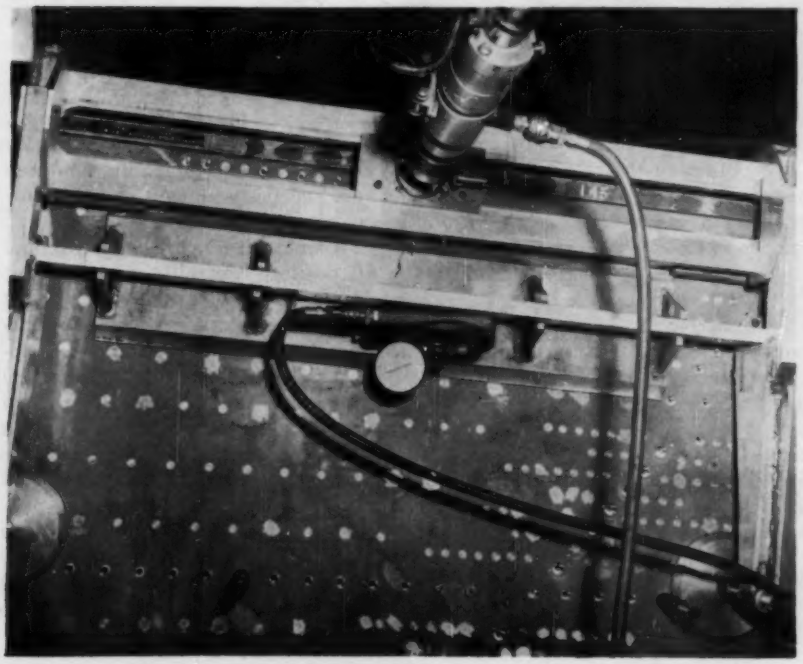


Double deburring unit smoothes both ends, inside and outside, of short lengths of tubing. Motor, gearbox, and two Osborn wire brushes are mounted in each head, one of which can be adjusted along rails for different workpiece lengths. Operator pushes tubing through gently, and brush action makes it rotate. Method speeds deburring 200-400%. *Wolverine Tube Div, Calumet & Hecla, Inc, Detroit*

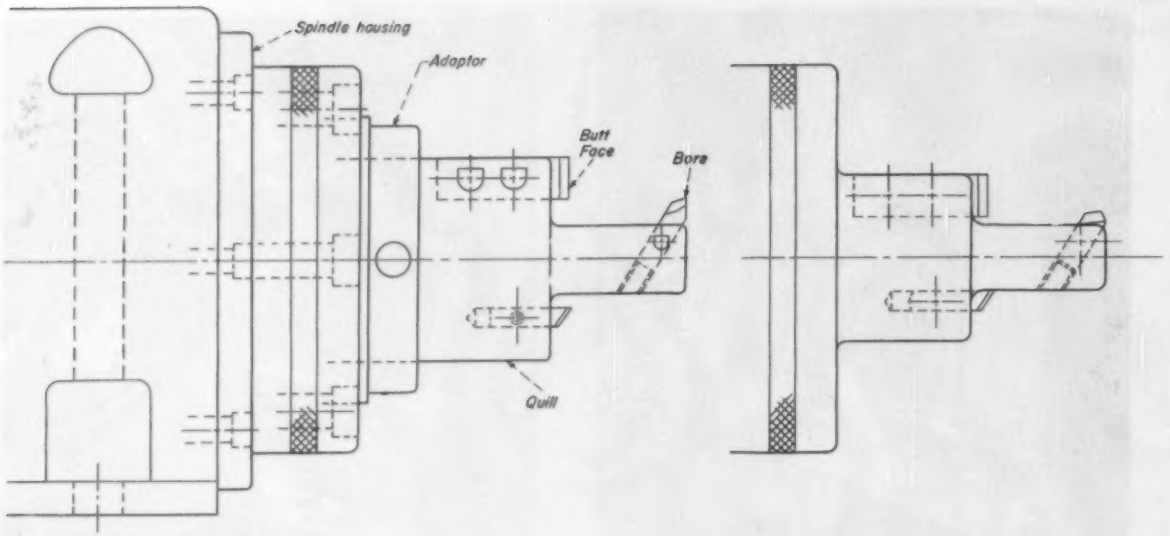


Induction heater fitted to BSA Acme-Gridley 6-spindle automatic locally hardens rocker-arm adjusting screws for IC engines. Special precision stock is used to simplify thread rolling (top center). Leads from Wild-Barfield high-frequency generator go through grounded screen duct to heating fixture (center). Work is cut off at right, then picked off by heater fixture. Coolant oil is routed from valves at left through solenoid-operated valve and concentrator unit that impinges coolant on the work when it reaches temperature in the fixture. Work is ejected to pan below. *Vauxhall Motors, Ltd, England*

Tilt fixture on horizontal grinder allows finishing both flat and V-ways without dressing the wheel anything other than straight across. Special angle blocks on ends of fixture are machined to touch grinder table, positioning work at necessary angle when slanted surfaces are being machined. Filler blocks slip under the angle blocks to position fixture horizontally when flat way is being ground. *Mattison Machine Works, Rockford, Ill*



Vacuum clamp assembly holds Airfeedrill in position against aircraft skin so it can drill and countersink rivet holes accurately. Drill is attached to plate that traverses in horizontal slide assembly, which must be aligned with hole positions. Indexing between holes is controlled by notched plate (out of sight behind slide assembly). Holding power is supplied by large plate in center, operated by venturi device that acts on shop air supply. Two round clamp pads (one is in sight at lower left) increase pressure of slide assembly on skin, with vacuum plate acting as fulcrum. Clamp replaces unwieldy plastic fixture.*Martin Aircraft Co, Baltimore*



Boring tool installed with adapter . . .
(left) has excessive overhang and fairly small quill diameter at end. These contribute to chatter and inaccuracy. Redesigned solid quill (right) has larger diameter and shorter length for higher accuracy

Why precision bores go bad

Next time your precision boring doesn't turn out as precise as you want it, check the boring quill and the work support. Cutting tools are often at fault, but sometimes they are blamed for errors without reason. Here is a checklist that shows what else might go wrong on a precision boring job

WILLIAM C CARR, equipment & tool engineer, PRATT & WHITNEY CO, W HARTFORD, CONN

"Precision boring" usually means holding accuracy at least to tenths of a thousandth, and sometimes to millionths. Add to this the fine microinch finishes usually required, and you have demands that can really strain good equipment to the limit.

Past experience has shown that tooling has often been redesigned to compensate for weaknesses in the machine or its accessories that may not even have been recognized. Boring heads are precision units, but sometimes the built-in accuracy is completely ignored. Spindles maintained in such a way that they are accurate only to within 0.0003 in. have been expected to produce work accurate to 0.0001 in., and finishes of 20 mu in. have been called for when the machine was actually not capable of obtaining this accuracy.

When you simply place your hand against a boring spindle and exert pressure, noting a movement of 0.0001 in. or more on the table-motion indicator, you know that new bearings are probably needed and that the whole machine should have a close inspection and a good overhaul.

POINTS TO CHECK

Fixtures for accurate boring require rigidity and strength, and locating devices must themselves be accurately located, both in parallel and angular relationships. Any one of these items, if not up to par, can ruin the accuracy of any job, in spite of makeshift corrections.

When more than one fixture is to be used on the table, aligning bars are necessary to insure accurate location for each fixture.

Cam control on a boring machine is positive control. Accuracy is not normally affected by fluctuations in hydraulic pressure, ambient temperature, or play in complex linkages. But even though the cams are hardened and honed, they can wear; sometimes even after only a few parts have been bored. The advantage of cam control is that after a good part has been produced, the cam and setup are proved accurate. Thereafter, only one cam dimension need be checked — if it is OK, so are the others.

MOTIONS AND POWER

Hydraulic table systems are subject to troubles, especially vacuum pockets and included foreign particles. These systems are of high precision, and minor flaws can cause machining errors easily. Care should be exerted in adding new fluid, maintaining the proper level, and bleeding the lines once in a while. Gummy ways and damaged gibs are two other danger signals to look for.

Belts and pulleys must be tight, with idlers properly operating and with the correct number of belts in place. Motors must deliver full power to the boring head, so belts cannot be operated if oil-soaked or cracked.

Boring machines are designed to absorb their own vibrations, but they are subject to upset if there are nearby heavy vibrations from large machines or trucks going by in an aisle. A vibration analyzer can often be usefully employed.

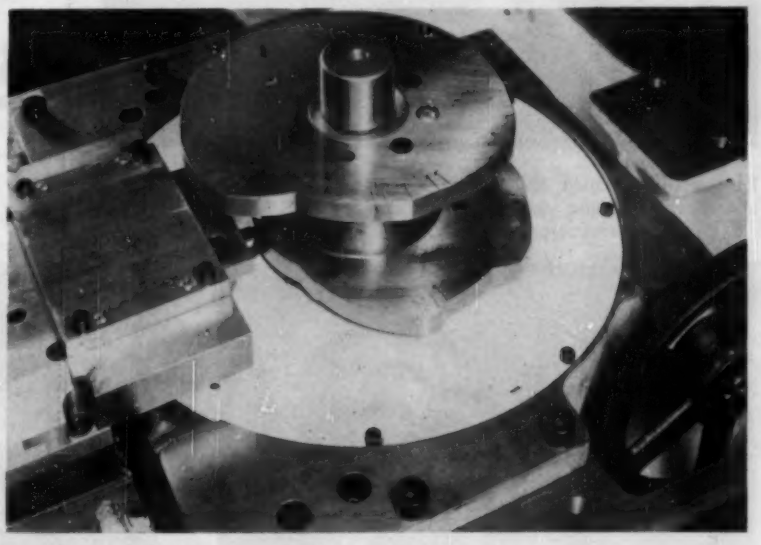
TOOLING UP

Boring quills can be designed for many jobs, but a few basic precautions should always be kept in mind. Rigidity and minimum overhang, as well as maximum quill diameter consistent with practical considerations, are all important. Adapters with removable quills are are often used, but they may be weak points in the tooling if care is not taken to insure solid mounting. Adapting an existing boring quill to a new job is generally poor practice; rather design a new one specifically for the work.

Toolbits for chamfering, butt facing, etc., can be made with the carbide brazed on the end, rather than on the top or face of the tool. This is quite practical and helps increase tool life because a carbide bit one grade harder than normal may be applied. Solid carbide bars may be installed to take advantage of rigidity and of reduced deflection. Shank materials of tungsten alloys are rigid and have high damping qualities. The material machines easily and takes brazing readily.

Consider installing mist lubricators; they place oil where it is required without waste. Possibilities of the new ceramic tools should be investigated.

Solid work support . . .
depends on rigid fixture and securely clamped locking devices. Important: Clean table so fixture seats firmly



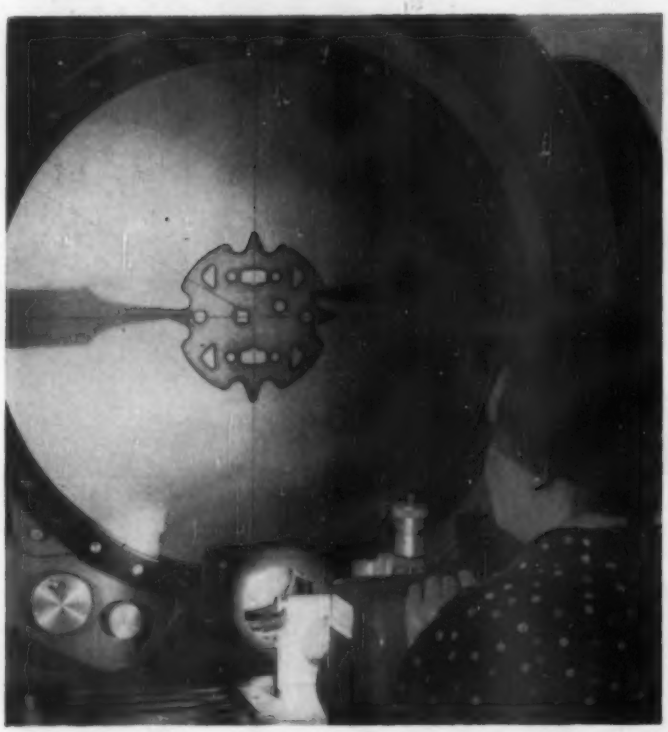
Cam control for boring machine . . .
allows simple checking. If parts come out off dimensions, cam can be reground to compensate for one or more errors

In summarizing, check these points:

Boring head	Cam
Part-holding fixture	Table
Hydraulic system	Quill
Machine Base	Belts
Vibration	Tools

Basically, there is one objective in boring: to meet the tolerances and finish called for. The equipment must be kept in condition as accurate as required in the work.

Electronics breaks a barrier in hand operations



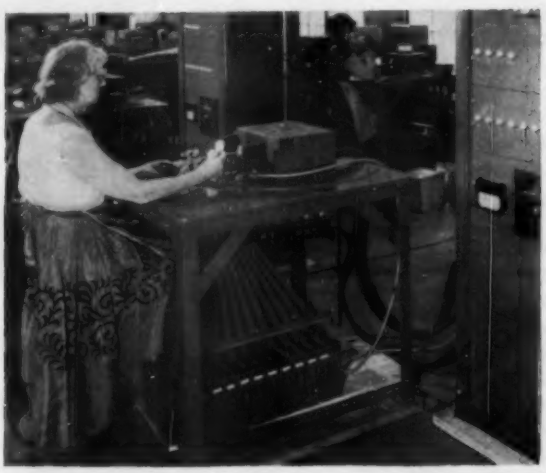
Inspection on 30-in. Kodak contour projector spot-checks contours, holes, and alignment of mica within 0.00025 in.

Six electronic gaging and automatic sorting units built by Federal Products Corp have cut 50% of the labor cost and 75% of the errors at Victory Mica Mfg Co, Brooklyn, where mica is fabricated into support elements for vacuum tubes. Mica thickness must be gaged closely for three reasons:

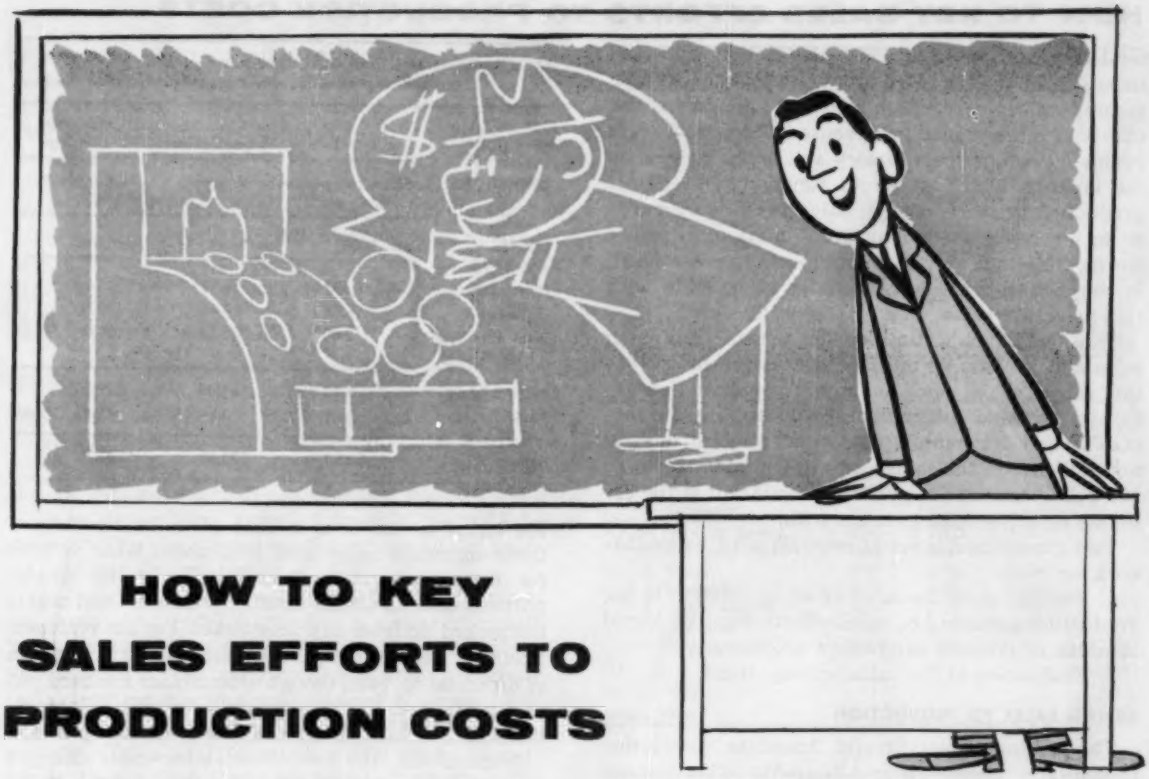
- Insulating qualities depend on thickness
- Automated vacuum-tube assembly demands uniform thicknesses
- Die life, at a cost of about $1000 for a new die, is extended if the mica is uniformly thick

The new thickness-gaging setup replaces operations that are traditionally manual. The old method was to actually measure each piece of mica with a dial indicator. Twelve operators were required, plus three for standby service, all of whom required three months of practice to gain full skill. Error rate was 20%. The new system allows gaging at a maximum rate of 120 pc/min. The machines are hand fed, but gaging proper is automatic. Mis-sorted pieces may still be picked up at final inspection, but gaging at the modernized setup means higher production.

Electronic sorting takes only six operators who can gain skill in three weeks or less. Light beam is interrupted when mica is inserted; this brings gaging contacts together to measure mica and operate classifier



Classifier separates mica into 10 categories from 0.005 to 0.015 in. Gaging contacts operate trap door that drops mica into appropriate container under table. Present error rate is only 5%. Sixty presses stamp 2 million tube supports per day



HOW TO KEY SALES EFFORTS TO PRODUCTION COSTS

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Are your profits (or losses) determined by production, or sales, or both? Everyone knows the value of a good salesman, but few know how to set up sales controls that will show how effective each salesman is, and how effectively production is functioning in relation to sales volume. This article—another in a continuing series on Management for the Small Plant—shows how to establish product costs, how to reconcile your estimates and cost statements with sales, and how to find which production facilities should receive sales emphasis. Production and sales must be coordinated if production efforts are to be utilized at maximum efficiency

Once production economy is under control (*AM*—May 20 '57, p153 and Jul 1 '57, p97), it is vital that gains in that area be fully exploited through selective selling.

Some companies allow their sales departments latitude in setting selling prices, particularly where job-shop production exists or where fixed product lines and published prices are not established. But this latitude can become a profit reducer if not exercised intelligently.

Management should set up controls that determine whether profits or losses are caused by Production or Sales or both. These controls will help management to ascertain that its salesmen sell the company's most profitable products. They can help establish product costs that accurately reflect production costs. And they can show whether the company is actually obtaining a reasonable profit from each sales dollar.

Consider the following estimate, in which the total cost of a machined part is $6:

Materials, factory labor, and overhead	$5.00
General overhead, administrative and selling expenses	1.00
Profit	1.00
Selling Price	$7.00

Let's assume that the sales department was able to get only $6.50 for the part, and that Production held its costs in line. Obviously the lack of sufficient profit was the fault of Sales, and Production should not be held responsible. If in another situation Sales could get $7.50 for the part, but production costs increased 50¢, management clearly should take steps to correct production, even though the originally estimated profit was obtained.

Normally, people use the word profit in estimating as the difference between cost and selling price. Often at the end of the year the profit stated in the estimate (the hope) is more than that shown (actually earned) in the Profit and Loss statement (the reality). Several factors can cause this difference: a faulty allocation of overhead to the estimate (this method of allocating will be discussed in a future article); an inability to obtain full sales prices; or a failure of Production to hold its estimated cost line.

Proper managerial controls reveal the profits made by Production as well as those obtained by Sales. In the above example, if Sales got $7 for the part and

total costs amounted to $5.50, Production was contributing 50¢ to the $1.50 profit. At best this simple accounting is a very rough method of appraising the efforts of either function, because (1) production is evaluated against past history and is not judged by the level at which it *should* function; and (2) if production is uneconomical, Sales has to work harder to get the same dollar profit margin. In other words, Sales not only is trying to increase the profit in the selling price, but naturally is carrying with this price the entire cost of the part.

Thus, while opportunities for profits from both sales and production must be considered before action can be taken, such action must be based on accurate, realistic information. Establishing 20 seconds as par for running the hundred-yard dash is not realistic; in the same sense, for production to go 50¢ below estimate may not be significant if the estimate is set too high to begin with.

Two generalized types of controls must be considered for Sales:

1. Evaluation of the sales effort in relation to the production picture; i.e., sales efforts must be keyed to areas of greatest production profitability.
2. Evaluation of the sales activity itself.

KEYING SALES TO PRODUCTION

The selling effort should translate production profits into greater over-all profits. This control places the greatest selling emphasis on those production processes or products that will yield the largest number of profit dollars, at times irrespective of gross sales dollars.

Control of sales efforts in relation to production should not rest in the sales department alone, nor should it be controlled solely by production. It should be controlled or advised by a function that can objectively coordinate information from both areas—by management through the controller's department or the industrial engineer.

FINDING PRODUCT COSTS

The first control step is to determine opportunities for production profits, either in the product or the process. This information can be produced only from a proper cost system. "Guesstimating" won't do it!

Consider a general job machine and metalworking shop with roughly $3-million in business a year. The company estimates such segments as direct labor and materials properly but assigns total overhead as a fixed percentage of direct labor in the amount of 150%, calculated from a previous P & L statement.

Here the company is unable to key selling efforts properly, either to the productive center or to the product. Any action based on the data shown in Table I will be of questionable value, unsupported by real facts. Here's why: This information represents data on the cost sheet and not actual costs.

Let's assume that the direct labor estimated is close to the actual amount after the job has been completed; that information is easy to obtain—it comes right from the time and production tickets. Let's also assume that the estimated materials costs

TABLE I: Estimate of Total Costs Per Product
(Overhead expressed as direct function of direct labor)

PRODUCT:	Small Drawings	Large Cabinets	Machined Housings
OPERATIONS:	Stamp, degrease, tumble, plate	Bend, weld, finish, assemble	Turn, mill, grind
COSTS:	per 1000	per each	per each
Direct Labor	$1.60	$14.90	$ 72.00
Materials	1.85	24.40	19.80
Total Overhead (150% D-L)	2.40	22.35	108.00
Total Costs	5.85	61.65	199.80
Profit	0.65 (10%)	10.88 (15%)	49.95 (20%)
Selling Price	$6.50	$72.53	$249.75

are equal to the actual. That gives us two of the three segments comprising total costs. What is vital for inclusion—and incidentally one of the largest portions of total costs—is total overhead. And this is not picked up from any time ticket. For convenience, tradition has designated its allocation as a function of direct labor, even though accountants are hard put to explain how such expenses as machine depreciation or rent can be allocated to a specific product.

Because the 150%-of-direct-labor-costs charged for overhead expenses was taken from a P & L statement, it represents an average charge for *all the facilities used in the plant*. Thus a buyer of small drawings overpaid, for he was charged for the overhead costs of more expensive facilities that were not used to make the drawings: lathes, millers, and surface grinders, for example. Conversely, the purchaser of the machined housing got a bargain, because the inclusion and averaging in of less expensive facilities—such as welding, finishing, and assembly—lowered the overhead assigned. Obviously the *actual cost of each product* cannot be obtained until a proper method of estimating overhead is applied; until that is done, no appraisal of product profitability can be made.

Here's how mistakes are made in this connection: The costing out, from time tickets and material controls, of a number of machined housings yields:

Actual direct labor each:	$ 60.00
Actual materials each:	19.80
Overhead (150% of D-L):	90.00
Total costs	$169.80

An apparent saving of $30 each over the original *estimated* cost is evidenced here. Feeling lightheaded, the sales department makes an intensive sales drive for this housing, and at the end of the year the results are negative. We have seen that because of the product mix, the housing should have carried a higher proportion of the overhead. Even the hoped-for profit in the estimate ($49.95 = 20%) was fallacious, let alone the profit increase of another $30.

Proper allocation of overhead by product is a cumbersome process; it can be done, but is not recommended for the metalworking industry, where

there are so many variables in product mixes. Some companies have recognized the differences in facility costs and have developed departmental or product overhead rates. For the three parts under consideration, the rates might look like this: small drawings, 120%; large cabinets, 180%; machined housing, 400%. But this procedure is just a refined way of using the same concept that makes the company a victim of condensed averaging and of its varying product mix, with danger of inconsistent pricing.

ALLOCATING OVERHEAD TO FACILITY

A much better way to pinpoint actual costs when the company has a variable product mix is to allocate overhead to the specific facilities that are involved in the manufacture of each product. A future article will detail the specifics of setting up a facility cost system, but we shall consider that such a system is in existence here, and that *product cost will be developed by the allocation of overhead to the process, facility, or cost center.*

In Table II, this method is developed for each of the three parts under discussion. A comparison with Table I reveals that the small drawings were overpriced by 9%, the metal cabinets underpriced by 10%, and the housing underpriced by over 50%. If the product mix contained an appreciable percentage of housings, the actual profits would be considerably less than those estimated—most probably there would be a considerable loss. Certainly buying interest would run higher for the greatly underpriced housing than for the small drawings, which must have been difficult to sell at the original price.

The estimated overhead for each housing was $108 by the old method and $387.40 – $72 direct-labor charges, or $315.40, by the new cost system. This higher overhead figure is the result of charging to the product *only those facilities used in its manufacture.*

Now we can key sales activity to profitable products or production centers. Let's see first how this plan works with an improved production method. On the housing, a method is found that reduces lathe time to 6 hours instead of 10. The saving here of $52.80 is reflected accordingly in the sales price. Selling emphasis can effectively be placed on this part and on other items for which lathes are used.

Besides improvements in production techniques, there is another way by which savings can be made: cutting costs by increasing the activity of the center. The machine-hour rate of the facility (lathe center) of $13.20 is arrived at through coordination of both sales advice and production efforts. Sales provides an estimate of how many products will be sold during the coming year; from this figure production determines the cost of manufacturing these products and the annual hours of machine use needed to satisfy the sales estimate. Thus

$$\text{Machine-hour rate} = \frac{\text{total annual expenses (excl. materials and profit)}}{\text{expected annual hours of machine use}}$$

TABLE II: Estimate of Total Costs Per Product (overhead allocated to facility)

SMALL DRAWINGS

Materials:				$ 1.85
Conversion Cost:				
Operation	Hours Facility Used	Cost/Hr, Facility	Cost	
1. Punchpress (draw, trim)	0.50	$ 5.50	$ 2.75	
2. Tumbling center	0.01	4.20	0.042	
3. Plating room	0.03	24.00	0.72	3.512
Total Costs				$ 5.36
Profit (10%)				0.59
Selling Price				$ 5.95

LARGE CABINETS

Materials				$ 24.40
Conversion Cost:				
Operation	Hours Facility Used	Cost/Hr, Facility	Cost	
1. Bend on brake	0.50	$ 7.50	$ 3.60	
2. Trim and notch	0.25	3.80	0.95	
3. Weld	3.00	6.40	19.20	
4. Assemble	3.00	2.80	8.40	
5. Grind smooth	0.75	3.20	2.40	
6. Degrease	0.25	4.20	1.05	
7. Spray enamel	0.50	14.80	7.40	43.00
Total Costs				$ 67.40
Profit (15%)				11.89
Selling Price				$ 79.29

MACHINED HOUSINGS

Materials:				$ 19.80
Conversion Cost:				
Operation	Hours Facility Used	Cost/Hr, Facility	Cost	
1. On lathes	10.00	$13.20	$132.00	
2. On miller	8.00	16.10	128.00	
3. On cylindrical grinder	3.00	24.50	73.50	
4. On surface grinder	4.50	11.80	53.10	387.40
Total Costs				$407.20
Profit (20%)				101.80
Selling Price				$509.00

If the estimated activity increases, the hourly cost of the facility decreases, irrespective of any methods improvement. Let's say that sales efforts kept the lathe center busier than estimated, causing a reduction in the machine-hour rate from $13.20 to $11.20. With no improvement in methods of production, the saving on the housing is $20; with the aforementioned improvement, the saving is $64.80. And for other products on which this lathe center is used, the hourly cost is $2 less. These savings, either from increase in machine activity or through methods improvement, may be passed on to the customer in some degree. The concepts of what is known as marginal pricing apply here; they are distinctly different from price cutting for competitive reasons.

Where pricing is traditional, that is, where customers are accustomed to paying about the same prices, savings in hourly facility costs need not be passed on, but can be retained to boost company profits. Where competition is keen, savings can be given to the customer in the form of lower prices, which have the effect of accelerating sales, further increasing the annual activity hours of productive

centers, and further reducing hourly facility costs (from this latter decrease may come more profits).

Areas of profitability in production, then, are also present in a product if that product is made with profitable facilities. The sales department must look at a potential product from the standpoint of which of its profitable facilities it can use to produce it.

Sometimes it is necessary to attract business that will recover the expenses of an unprofitable cost center. Let's say that the company is "stuck" with an expensive productive center—for example, the cylindrical grinder ($24.50/hr). A proper cost system correlated with a proper sales forecast would have revealed that buying the grinder was uneconomical. Now, because the company has accounts that expect this type of machining service, it must keep the center in operation, with the hope that running losses can be minimized. Here again—even with traditional pricing—a reduction of expenses, even if insufficient to recoup all the center's losses, is a gain to customers. Ultimately the company will gain, if the center's hours of activity are increased to the point that the company at least breaks even on the grinder's operation.

MAKING PRODUCTION CENTERS PAY OFF

Once actual overhead expenses have been assigned to the respective productive center, rather than averaged out over all production, it becomes possible to gage the profitability of each center, and to approach the answers to certain questions about costs: Which centers are making profits and which are not? Are machine-hour rates for certain centers too high? too low? Are projected hours of annual use too high? too low?

Table III, a cost-recovery statement for the quarter beginning 1/1/56, assigns specific machine-hour rates (that include all labor and overhead expenses) to each cost center. Here *estimated* yearly expenses and *projected* annual hours of use for each center are compared with *actual* activity hours for the first quarter. The production profit or loss for the quarter appears in the far-right column.

Table III would actually be a P & L statement if material usage and sales figures were included; but it is really more dynamic, because it lends itself to ready trouble-shooting. This table reveals that profits and losses vary widely among the centers. Why these variations? Are the under-recoveries (losses), for instance, the result of insufficient sales activity, or over-projection of annual hours? Which hourly charges should be raised or lowered to achieve maximum profit compatible with capacity and markets?

Table IV, which attempts to solve problems raised by the results shown in Table III, is a cost-recovery statement for the following quarter. Here are shown some of the changes made during the second quarter to recover some of the first-quarter losses. A comparison of the tables will show improvements made.

Notice that if there were no cylindrical-grinder center, profits would have been earned for both

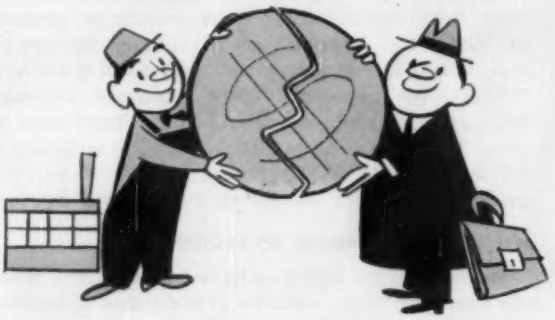


TABLE III: Cost-Recovery Statement (End of First Quarter, 1956)

Cost Center	Projected Annual Hours of Use	Estimated Yearly Expenses	Machine-Hour Rate, 1/1/56	1st Quarter Activity Hours	Production Profit or (Loss)
Punchpress	2000	$11,000	$ 5.50	600	$ 550
Tumbling	600	2,520	4.20	160	—
Plating	1800	43,000	24.00	500	1250
Brakes	1400	10,080	7.20	300	(360)
Trim, Notch	2000	7,600	3.80	350	(570)
Welding	1000	6,400	6.40	250	—
Assembly	1200	3,360	2.80	300	—
Grinding	500	1,600	3.20	125	—
Spray Room	2000	29,600	14.80	550	740
Lathe	1800	23,760	13.20	500	660
Mill	1600	25,760	16.10	350	(805)
Cylindrical Grinder	(500) 1600	39,200	(78.40)* 24.50**	100	(7350)
Surface Grinder	1600	18,800	11.80	400	—
			Net Loss, First Quarter:		($5885)

* True rate based on true projection—unsaleable.

** Contrived rate to stimulate sales, based on increased but unattained activity.

quarters, provided that non-related fixed charges (space occupancy) allocated to this center were absorbed by increased activity at other centers. If the center were not in existence, machine depreciation wouldn't be either; but the space reserved for it would still be present, and charges for this space would have to be reallocated.

A decision made on 4/1/56, to sell work at the grinding center at cost, lowered the total product cost of items that required cylindrical grinding. Sales increased, and of course activity at this center increased, until the 1600 annual activity hours became a reality. And at this point the $24.50 hourly rate, contrived to attract business, became a true reflection of costs. As a matter of policy, the company never added profits to the cost of this center, and was greatly pleased to recover all its expenses and break even. The sales department continued to look out for sub-contract machine time if activity started to slip. At one point the company had those

grinders busy 2000 hours a year: 1600 for their own items and 400 for farmed-out parts. The 400 hours provided an over-recovery of $9800 per annum. This was their sole opportunity for profits, for no profit figure was ever added to the $24.50 hourly charge.

Some companies, especially the larger ones, prefer to make their cost-recovery statements and analyses monthly rather than quarterly. Regardless of the control interval, the most profitable cost centers are brought to the attention of the sales department, which can then translate the information into new product applications. Sales also learns which cost centers are not carrying their share in the total cost-absorption picture (generally these are the more expensive cost centers). The controller can translate the effect of the under-recovery into dollars and thus set out a target for the sales manager (whose remuneration, by the way, is sometimes tied in with this item). Where under-recovery is due to an over-projection of annual hours, the controller can make adjustments and advise sales and estimating.

EVALUATING SALES ACTIVITY

The sales manager can use this control to direct sales efforts to the proper markets. Analyses are needed here of company accounts, geographic areas to be assigned, product areas, areas of greatest potential, present account potential, and new business. Often salesmen are assigned to areas that have not been researched, and what results is low sales-labor utilization and high costs per sales call, as well as too low a penetration of the market.

The company may be paying a fixed commission rate (perhaps by product groups) for new as well as repeat business. Obviously it is easier to resell an old account. The following plan, however, will distinguish between sales efforts ranging from the pure sale (new business) to the pure service function:

Account Age	Commission Paid
Up to one year	4%
One to two years	3½%
Two to four years	2¾%
Four to seven years	2¼%

This compensation plan (together with other features too numerous to mention here) was used with success at a metal stampings plant. The age-of-account concept was the vital factor that stimulated new business. Other types of industries will show varying age and commission schedules.

Here are a few controls that a sales manager may use to gage his department from period to period:

A. Total sales/mo and No. of accts sold—Rates overall activity.

B. Total new sales/mo and No. of new accounts—Rates new business activity.

C. B ÷ A—Rates percentage of new business by sales dollars and accounts.

Sales activity can be directed to serving the company's most profitable productive centers. Compare Table IV (right) with Table III on the opposite page to see what changes were made to "push" sales activities for some centers, "hold" sales activities for others.

TABLE IV: Cost-Recovery Statement (End of 2nd Quarter, 1956), Showing Action Taken to Improve 1st-Quarter Results (Table III)

Cost Center: Characteristics—Analysis—Action	Revised Machine-Hour Rate, 4/1/56	2nd Quarter Activity Hours	Production Profit or (Loss)
Punchpress—Insufficient capacity to justify hourly cost reduction for increased capacity. Over-recovery transferred to profits.	$ 5.50	570	$ 385
Tumbling—Capacity available. Reduce hourly cost to accelerate and attract additional activity to the point of over-recovery, even though present activity fully recovers. Partial gains to customers.	$ 3.70	250	$ 295*
Plating—Sales reports projection too low. Customers are overcharged. Adjust to split difference.	$22.75	550	$1762.50*
Brakes—Projection set too high. Adjust for even recovery.	$ 8.40	300	—
Trim, Notch—Sales activity low. Cost is lowest based on maximum-capacity projection. Push sales. Don't adjust rate.	$ 3.80	450	($190)
Welding—Have sales push. Gains to be retained by company. Decrease cost slightly and notice effect on recovery.	$ 6.20	310	$ 322*
Assembly—Hold, no change.	$ 2.80	320	$ 56
Grinding—Hold, no change.	$ 3.20	110	($48)
Spray Room—Take same action as with punchpress.	$14.80	525	$ 370
Lathe—Capacity available. Obviously profitable center. Have sales push. Hold cost.	$13.20	500	$ 660
Mill—Projection correct. Sales push needed. Hold cost.	$16.10	500	$ 1610
Cylindrical Grinding—Sell center at cost (no profit) to accelerate absorption of more expenses. Hold lower hourly cost.	$24.50	350	($1225)
Surface Grinding—Hold, no change.	$11.80	440	$ 492
* Notice that profit was made even with decrease of hourly charges. Reason: Attraction of greater sales whose expense absorption exceeded decreases in charges.		Net Gain, 2nd Quarter:	$ 4489.50
		Net Loss, 1st Quarter:	5885.00
		Cumulative Net Loss, 1st Half:	($1395.50)

HOW TO KEY SALES EFFORTS TO PRODUCTION COSTS...

ARE YOUR ESTIMATES CONSISTENTLY RECOVERING EXPENSES?

The test given below will show you how to check your cost system against your estimate.

1. Take a group of representative estimates for the year 1956, that include about 90% of your product mix, and make one weighted composite estimate from them, as follows:

Product:	Part A	Part B	Part C	Part D	Part E	Weighted Composite Estimate	% of Selling Price
Production Mix Distribution:	10%	5%	50%	25%	10%		
Direct Labor:	$ 72.00	$14.90	$1.60	$11.10	$ 4.30	$11.96	27.2
Total Overhead:	108.00	22.35	2.40	16.65	6.45	17.93	40.8
Materials:	19.80	24.40	1.85	2.75	19.45	6.76	15.4
Total Costs:	199.80	61.65	5.85	30.50	30.20	36.65	
Profit	49.95	10.88	0.65	3.39	5.33	7.27	16.6
	(20%)	(15%)	(10%)	(10%)	(15%)		
Selling Price:	$249.75	$72.53	$6.50	$33.89	$35.53	$43.92	100.0

2. Condense your 1956 P & L Statement:

Sales:	100% = $2,800,000	
Direct Labor:	$ 649,600 = 23.2%	
Total Overhead:	$1,682,800 = 60.1%	
Materials:	$ 425,600 = 15.2%	$2,758,000
Profit:	1.5% = $42,000	

3. Compare results from (1) and (2):

	Estimated Expenses	Actual Expenses	Estimate Over- (Under-) Recovered, per Sales $
Direct Labor:	27.2%	23.2%	$0.040
Total Overhead:	40.8%	60.1%	($0.193)
Materials:	15.4%	15.2%	$0.002
Profit:	16.6%	1.5%	($0.151)

D. Total monthly company sales ÷ total monthly industry sales—Rates company's penetration of market.

E. Total sales/man/mo and accts sold—Rates productivity of the individual salesman.

F. Total calls/customer/year vs customer's buying potential—Rates balance between effort and market.

G. Total sales/customer/year vs customer's potential—Rates % of customer potential obtained.

H. Total sales expense/mo—Rates economy of sales department.

I. Total expense/man/mo—Rates effectiveness of or justification for expense items other than commissions—entertainment, travel, etc. This control really judges the salesman's ability to strike a balance between expenses and opportunity for sales.

J. Total quotations sold and lost/man/mo and dollar value of each part—Rates over-all activity of salesman.

K. Total calls/man/mo (letter, phone, visit)—Rates over-all contacts of salesman.

L. Total sales/mo/geographic area vs area potential—Rates company penetration in each area.

Often a low Control G on an account indicates that salesman and prospective customer have incompatible personalities; a rotation of men and accounts will improve this control A low D generally is indicative of wasted efforts in low-potential areas shown by L; the salesman's efforts should be shifted to areas with greater potential, that is, the effort should be keyed to the market. If E dollars are high and E accounts are low, a check of J and K will probably confirm that the man is satisfied with the money he is receiving from a few choice accounts held for many years. If he is able to service these accounts by working only 40% of the nominal work week, then he is not a full "body" employed in the sales department, and probably plays a very good game of golf.

SALES AND PRODUCTION COORDINATED

Once the two general controls—evaluation of sales in relation to production and evaluation of the sales effort—which have been the subject of this article are in effect, management can direct its attention to getting maximum profits from the sale of its production with a minimum of cost and effort. As always, management is interested in customers' potentials, but now only for those items that the company can produce profitably. The key factor here—and it cannot be stressed too often—is that sales and production must be coordinated if company activities are to remain healthy.

In the same sense, the expenditure of capital is a vital part of the production picture. How capital bolsters production, and what part it plays in the small-company business, is the subject of the next article.

Feedback Quiz

1. *What are the major profit-making areas in a manufacturing company?*
2. *Distinguish between production profitability and mark-up on cost.*
3. *What are the disadvantages of paying full sales commissions for servicing of old accounts?*
4. *Why should there be a balance between sales efforts and markets?*
5. *Under an overhead-as-function-of-direct-labor concept of costing, why is the company victimized by a fluctuating product mix?*
6. *Which production center costs your company more per hour to maintain: punchpress, sensitive drillpress, radial drillpress? Why?*
7. *When should savings be passed on to customers?*
8. *Relate profit and loss to under-recovery and over-recovery.*

ROUND TABLE

Company-Approved Sack Time?

"What do you suppose I should do about a guy who finishes eight hours of work in six hours, then goes back on the shipping dock and logs sack time in a packing crate?"

"This must be a guessing game, Al. I know darned well nobody around here does that sort of thing."

"The hell they don't, Ed. You know I've got Burt Smith working on machine cleanup. Well, he's the one."

"How come he's still working here? He should be fired fast for sleeping on company time."

"I suppose you're right, Ed, but there's really nothing we can do about it. We've had complaints from some of the other men, but nobody else wants the job. Besides, we made a couple of men try it, and nobody can do as much work in eight hours as Smith does in six."

"Why don't you restudy the rate? If he can do the job and have time left over, there must be something wrong."

"We did restudy it, and there's nothing wrong. He simply works like a cyclone while he's working, and then he goes to sleep."

"You ought to put him on some other job, if he's that good, Al."

"He won't take another job, Ed. Besides, he hasn't any real training. I doubt if I could use him any place else in the department."

"You've got hold of a real character, Al. It beats me. Are the men still complaining about him, even after he proved he was doing a full day's work?"

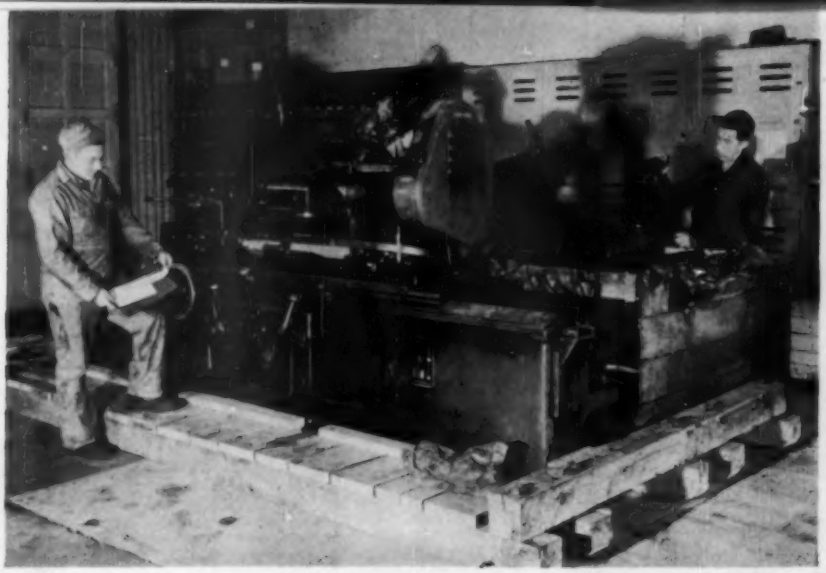
"Well, they've quieted down some. I think the shop steward told everyone about the restudy we made, and I don't think the union is going to make a fuss about it. They're as baffled as I am."

"Maybe you'd better just leave things alone, Al. There's always an odd ball in any group. Maybe Smith is yours."

"Sure, but how am I going to explain him to top management if they ever start asking questions?"

• • •

***SHOULD AL** just forget the whole thing, or should he turn the problem over to the supervisor? How many shops have one or two of these odd problems that never seem to get solved? Your opinions may help others. Discussions of earlier topics start on page 192.*



Incoming machines . . . at GSA preservation depot are inspected, and loose parts and accessories are removed for separate cleaning. Machines generally are left on their skids throughout cleaning and preservation operations

Latest techniques put . . .

Machine tools in mothballs

Preserving and storing government-owned machine tools for use in future emergencies is an important job of the General Services Administration. The techniques employed at GSA preservation depots to protect the taxpayers' investment in machine tools will provide you with tips that should be helpful anytime you decide to store a machine

as told to BEN C BROSHEER, associate editor,
by ROBERT L HAMM, Chief, Industrial Equipment Div,
Defense Materials Service, Region 5,
and GEORGE A KELLY, Project Manager,
Green River Preservation Dept,
GENERAL SERVICES ADMINISTRATION

Many of the machine tools owned by branches of the federal government, which might be needed for a national emergency but are not immediately necessary for defense production, are released to the Defense Materials Service of the General Services Administration for preservation and storage. These surplus units can be stored as circumstances dictate —by the contractor to whom they were last assigned or by shipment to a GSA-DMS preservation depot. Final decision on storage depends on how each machine can best be preserved for future use at the least ultimate cost to the taxpayer.

Machine tools stored by a contractor may be (1) left in their operating locations, with power lines intact, or (2) removed to a heated or dehumidified storage area under carefully worked out procedures that, wherever possible, follow closely those employed at the several GSA-DMS preservation depots.

"STANDBY" STORAGE PROCEDURE

Units stored by a contractor in "standby-under-power" condition are processed as follows:

1. All exterior surfaces, as well as accessories and related equipment, are cleaned of metal turnings, chips, and other foreign matter.

2. Hydraulic systems are properly filled and covered to protect against contamination.

3. Lubricating systems—including all headstocks, gear boxes, etc—are drained, cleaned, and refilled with an oil preservative medium (Mil Spec L-21260, Grade 1). This combination light lubricating and rust-inhibiting oil contains a VCI (vapor-corrosion-inhibitor) additive that eliminates corrosion of machined surfaces under almost all conditions.

4. All external bright and machine-finished surfaces are coated with the same rust-inhibiting oil.

5. All bearings are charged with regular operating grease or oil, according to manufacturers' recommendations.

6. Each machine tool or other power-driven mechanism stored in "standby-under-power" condition is put through a short operating cycle at reg-

ular intervals to assure that deterioration of precision surfaces has not taken place. Generally, each machine is operated under power for 5 min per mo.

PROCEDURES FOR EXTENDED STORAGE

Machine tools to be stored for extended periods in a contractor's plant, or in a GSA-DMS depot, generally are processed as follows:

1. Machines to be stored in heated or dehumidified areas are inspected. A record is made of the condition of the machine and all accessories, jigs, fixtures, and other equipment to be stored with it.

2. Where the machine and accessories are to be cleaned externally in a spray booth (as at GSA's Green River Preservation Depot), all electric motors and controls that might be damaged by solvents are removed and sent to a separate area, where electrical equipment is processed for preservation. There they are cleaned of dust and other loose foreign matter with low-pressure dry air. Exterior surfaces are cleaned with cloths or cellulose sponges dipped in a cleaning solvent (Stoddards or Fed Spec PS-661).

Motors, generators, and electrical control equipment—whether processed on or off the machine tool—are sealed after cleaning to prevent entry of moisture, dust, or other foreign matter. Sealants are a waterproof barrier material impregnated with VCI (Mil Spec C-3420) and water-resistant adhesive tape (Jan-P-127 or equal). Exposed shafts of motors, generators, and motor-generator sets are coated with Mil Spec C-16173-A, Grade 3 preservative.

Where electric motors and controls are remounted on cleaned machines for short power operating cycles prior to final preservation, their enclosure for preservation is delayed until preservation operations are started on the machine itself.

3. External surfaces of each machine tool and accessories, jigs, and fixtures are cleaned of all metal turnings, chips, and dirt with dry compressed air, by brushing or by other suitable means. Sludge, oil, and grease are removed by flushing or wiping with cloths or cellulose sponges, using a cleaning solvent (Fed Spec PS-661 or equivalent) that leaves a light, oily film on the cleaned surface.

SPRAY-BOOTH CLEANING

At GSA's Green River Preservation Depot, solvent cleaning of external surfaces of machine tools is done in a special spray booth made up of sixteen 4-ft-wide, 12-ft-high panels salvaged from surplus stores. On each panel are mounted six horizontal manifold pipes, spaced 18 in. apart, that are oscillated by a hydraulic motor through which the solvent passes at 50 to 60 psi before reaching the nozzles. On the manifolds the nozzles are spaced 18 in. apart. Five panels make up each side wall, and three panels are used for each of the end doors of the spray booth.

Solvent is heated to 150 F by steam lines in a sump under the booth, then is pumped to the nozzles by two 150-gpm pumps. A small centrifugal pump purges the sump when the solvent has to be replaced, and also supplies two manually directed nozzles that apply extra solvent to hard-to-clean areas on a

GENERAL SERVICES ADMINISTRATION
PUBLIC BUILDINGS SERVICE
NATIONAL INDUSTRIAL RESERVE DIVISION

EQUIPMENT RECORD

Nonexpendable Property

1. Sheet Serial No. DER-xxxx
2. Inventory No.

3. Nomenclature: MILLING MACHINE
4. Plant Location (Name, address, and code number)
5. Account No.
6. Commodity Classification No. 3417-4110-4800
7. In Plant Location
8. Stored Location: Bldg. xxxx Bay xxxx
9. Condition Code: Q2 (Date / Cost)
10. Item Added to Facility: Yes / No: X
11. If Added—Is Item Readily Removable? Yes / No:
12. Original Cost—Actual—Estimated* (Line one out): $3,126.00

13. Complete Description (Name of manufacturer, model number, serial number, accessories, attachments, date of manufacture, etc.)

Quantity: 1

Manufacturer: Brown & Sharpe Mfg. Co.
Address: Providence, R. I.
Model No. 000 Plain / Serial No. xxxx / Year Built: 1943

Location of Accessories, Component Parts and Attachments if Not Attached to Equipment

MILLING MACHINE: Angular head; bed type, special purpose machine equipped with special feed cams; table size overall 7-7/8" x 25-3/4"; work area 5" wide, 21" long, 6" table travel; #7 Brown & Sharpe taper spindle; 4" vertical adjustment on work head, 3" adjustment on arbor; 321-607 RPM on spindle; table feed 4-1/8" to 24-3/8" per minute; 0.002" graduations on cutter and 0.001" graduations on vertical adjustment; belt driven with 4-step cone pulley; head in fixed position approx. 45° angle to table; coolant built into base of machine; equipped with electrical controls.

Accessories: 3 change gears; 1 coolant pump with motor; 1 special cam on machine.

Motors: Table Travel: G.E., 1/3 hp, 220/440 V., 3 ph., 60 cy., 1725 rpm, Ser. NA.
Spindle Head: G.E., ¾ hp, 220/440 V., 3 ph., 60 cy., 1140 rpm, Ser. NA.
Coolant Pump: G.E., ¼ hp, 220/440 V., 3 ph., 60 cy., 1725 rpm, Ser. NA.

Skidded Floor Space - 19 sq. ft.

Mfg. Code - 09058-C1 Input Power Code - 44

Remarks: Limit switch broken; table return shaft bent; cable missing on table return.

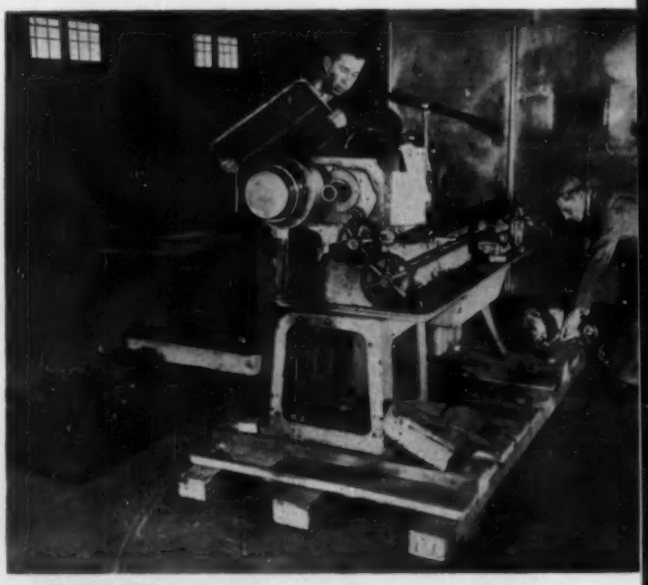
Date Processed - 11/8/56

Note.—If any accessories, component parts, or attachments are not attached to item of equipment when indicate in description the building location of those items—see division of block 8 to show changes in building location of basic item of equipment only. If accessories, component parts, or attachments are not attached to item of equipment then clearly indicate thereon PSA inventory number (block 2) followed by the letter "A."

*Equipment readily severable—Cost will be f. o. b. factory cost. Equipment not readily severable—Cost will include costs of erection and installation.

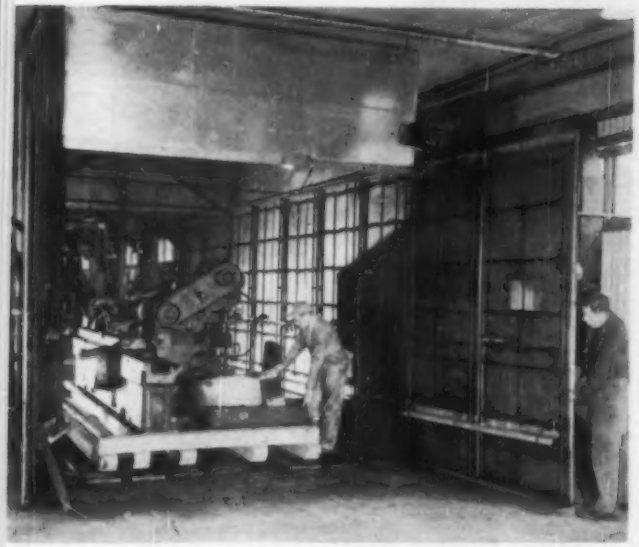
14. Date of Inventory: 11/1/56
15. Signature and Title of Authorized Representative

Equipment record form . . .
prepared for each machine tool shows the complete specifications for the machine. It records any defects found during inspection, cleaning, and preservation. Such defects are not corrected before the machine is warehoused, because it will be shipped in "as-is" condition



Separate skids . . .
are provided to hold guards, covers, and accessories that are removed as the machine tool is prepared for cleaning

Machine tools in mothballs . . .



Machine on wood skid . . .
is pushed onto roller-conveyor floor of cleaning booth with heavy industrial truck. Machines or parts 14 ft high can be moved into booth by raising hinged panels

In teardown-rebuild areas . . .
major subassemblies are removed to permit cleaning and application of preservatives to surfaces of precision parts covered up when machine is assembled

machine. Used solvent drains back to the sump through the roller-conveyor floor of the booth.

Cleaning cycles in the booth normally consist of 5 to 10 min of spraying and 10 to 30 min of soaking, to permit the hot solvent to penetrate tightly adhering coatings of grease or hardened preservatives. These spray-soak cycles are repeated until all surfaces of the machine are cleaned.

After the final spray-and-soak cycle, doors at each end of the booth are opened. When solvent fumes have been exhausted, workmen enter the booth and swab down the machine (together with accessories, placed on skids) with vinyl-plastic sponges.

CLEANING INTERNAL SURFACES

Internal surfaces, and interiors of lubricating and coolant systems, are cleaned by draining and, where necessary, flushing with PS-661 solvent or a detergent solution. At Green River, lubricating and hydraulic oils drained from incoming machine tools, as well as used cleaning solvents, are delivered to a sump and burned in a furnace that provides steam both for heating the spray-booth solvent and for heating the preservation shops in winter months.

At Green River covers are removed from headstocks, gear boxes, etc before the machine is moved into the spray booth, so that much of the internal cleaning is accomplished during the spray-and-soak cleaning cycle. At times it may be necessary to remove major subassemblies from the machine bed to clean interior surfaces adequately. In such cases, some parts and smaller subassemblies may be cleaned by immersion in a vapor degreaser.

Upon reassembly, machines cleaned internally are refilled with rust-inhibiting oil (Mil Spec L-21260, Grade 1 or 2) and, whenever possible, operated under power for at least 5 min to flush the lubricating system. This preservative is then drained. Where the unit cannot be flushed under power, it is filled with preservative oil, then drained.

PRESERVING FOR STORAGE

Cleaned machines, accessories, and tools are preserved for extended storage by:

a. Filling lubricating systems, including headstocks and gear boxes, with VCI rust-inhibiting oil (Mil Spec L-2160, Grade 1 or 2, as may be required). This filling usually does not need to be to the levels necessary for normal operation of the machine. A low level of VCI oil generally is adequate for protection, especially in a dehumidified warehouse.

b. Filling coolant and other water-solution reservoirs with VCI rust-inhibitive oil (as above) to a level that will permit circulation of the oil throughout the entire system. Grease-lubricated bearings are relubricated as recommended by the machine manufacturer.

c. Filling all hydraulic systems to full level with VCI rust-inhibiting oil (Mil Spec L-21260, Grade 1).

d. Replacing cover plates, etc, to seal systems.

e. Attaching caution tags to the above systems to insure that the rust-inhibiting oils will be drained and replaced with cutting or lubricating fluids before the machine is placed back in operation.

f. Properly cleaning and shrouding electric motors and controls, as outlined above.

g. Removing all belts and wrapping them in VCI-impregnated waterproof barrier material (MIL-C-3420) and adhesive tape (JAN-P-127).

h. Coating all exposed machined or hand-finished surfaces (except painted surfaces) after cleaning, with Mil Spec C-16173-A, Grade 3 preservative ma-

terial. Surfaces of sliding parts, such as tables and spindles, leadscrews, tailstocks, and machine ways—parts in close tolerance with other parts or in contact with opposing surfaces—are first coated with Mil Spec C-16173-A, Grade 3 preservative; then the parts are locked in place.

i. Relaxing tension on all springs and other tension devices.

j. Detaching all removable accessories—such as chucks, faceplates, steadyrests, toolholders, and wheel dressers—for separate storage in boxes to be attached to the machine or machine skid. Such units are preserved in the same manner as the machines themselves, then are permitted to "air out" prior to wrapping or boxing, so that volatiles in the preservatives will escape.

Tools and accessories removed from machines can, after being cleaned and coated with preservative (usually Mil Spec 16173-A, Grade 3), be wrapped for protection in Grade C, Type 1 greaseproof barrier material (JAN B-121). Small items weighing under 50 lb can be wrapped in moldable VCI material conforming to Spec MIL-1-3420 laminated to Grade C, Type 1 greaseproof barrier material (JAN B-121); packed in a JAN-108 box; and sealed with JAN P-121 tape. Larger items (over 50 lb) are wrapped with VCI coated 60-lb Kraft paper (MIL-C-3240) and bolted or blocked into a wood box or onto a skid.

Gages and measuring instruments with intricate and delicate assemblies—such as comparators, projectors, and toolmakers' microscopes—must be properly blocked, cradled, and padded in boxes (JAN P-106) containing up to 500 lb each. Items should be wrapped in 60-lb crepe Kraft paper treated with VCI (MIL-C-3420). Less complex all-metal gages—such as go/no-go, plug, and ring gages—should be packaged in the same manner, except that multiple packaging can be used.

Jigs, fixtures, gages, and accessories not attached to a machine must be properly identified with the parent machine on a packing slip, placed in a greaseproof envelope stapled to the outside of the container. The container exterior must also carry the serial number and name of the parent machine. The container should be stored with the machine, preferably on the same skid.

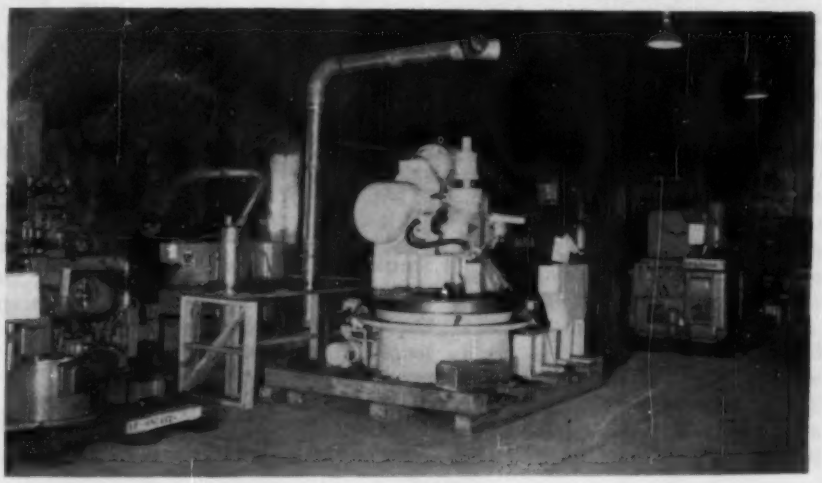
METHODS OF STORING

Two methods for warehousing cleaned and preserved machines and accessory containers have been found suitable: heated storage and dehumidified storage.

In heated-storage warehouses, heat must be continuously maintained during non-temperate months, so that temperatures do not fall below 50 F. During spring and fall, when rapid changes in temperatures are likely, particular care must be taken, so that moisture will not settle on or within the stored equipment.

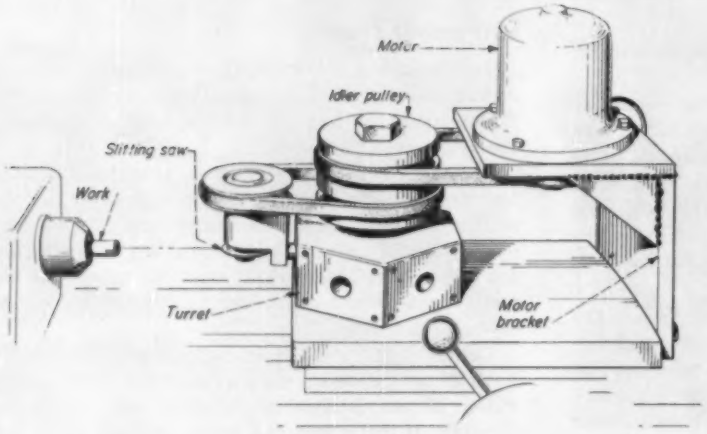
Dehumidified storage is considered preferable to heated storage, and is used at the GSA-DMS preservation depots. Individual dehumidifiers are spotted throughout the warehouse areas, and are set to hold humidity within the warehouses to less than 35%. The humidity in each storage area is checked and recorded each two hours around the clock, every day in the year. In addition, inspection teams spot-check stored machines once a month—on a schedule that insures a review of each machine at least twice a year—for signs of rust or other corrosion on exposed machined surfaces. Because the preservative now used on such surfaces is transparent, any signs of corrosion are quickly seen.

Machines stored at the several GSA-DMS depots range from small bench units to very large planers, boring mills, and resistance welders. Some are so large they had to be dismantled for cleaning and preservation, but all were reassembled for storage. Because handling facilities are limited, some ingenuity has been needed to help move and align the parts, but the work has been done at reasonable cost in every case. Accompanying photographs show typical cleaning, preservation, and storage operations at GSA's Green River Preservation Depot in Illinois.



Stored machines . . . are placed in dehumidified warehouses. Small, automatically controlled dehumidifiers (left, inside railing) are checked every 2 hr by patrolling watchmen. In addition, inspectors check each machine at least twice a year for signs of corrosion.

PRACTICAL IDEAS



Turret Lathe Slotting Attachment

We recently fulfilled an order for a large number of small parts, all of which required a screwdriver slot in one end. This would have been an easy job in an automatic screw machine, but since we don't own one we had to use the next best thing: our turret lathe with the illustrated slotting attachment.

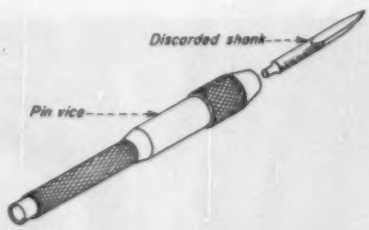
This saved us the time that would have been wasted in making and using a special holder for slotting, transport the work from one machine to another, to set up, and to remove the work from the holder. Our attachment permits full rotation of the turret, uses only one of the stations, and does not interfere with other tooling.

Standard operations like turning, undercutting, and threading are done before slotting and cutoff. No dimensions of the parts of the attachment are given because these will vary with the size of machine used. Machine may be hand operated, or air cylinders can be installed for semi-automatic operation on the turret and cross-slide, as we did.

The attachment is made in three parts: the saw-spindle adapter, an idler pulley, and the motor bracket. The spindle adapter is made with a shank to suit the turret. This arrangement also provides for adjustment of the belt tension between the spindle pulley and the idler. The spindle is fitted with thrust collars to hold the saw at the proper center line. An aluminum V-belt pulley mounts on the spindle and must be low enough to pass under the motor pulley when the turret is rotated.

Idler is mounted on a shaft in the center of the turret. We cut a pair of V-belt grooves in a straight aluminum bar, but step pulleys can be used for speed regulation between the motor and the idler. Steel plates make up the weldment used as a motor-mounting bracket, which is bolted to the end of the turret slide.

John W Healey, Akron, Ohio



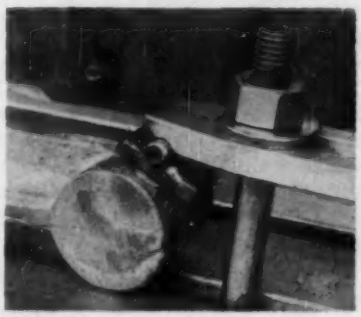
Small Hand Tools Made From Discarded Shanks

The idea of throwing away the shanks of small broken end mills never appealed to me. It seemed to be such a waste not to make use of a good piece of tool steel.

I have made many of these shanks into useful hand tools such as triangular scrapers or engraving tools. Handles can be made in any size or shape as preferred. Personally, I like to chuck them in a pin vise. This way only one handle is necessary and the tools are interchangeable.

There are many other uses for the shanks, such as special small turning or boring tools, but the hand tools are the ones I find most useful.

Glen E Price, Caney, Kansas



Self-Seating Pad Clamps Irregular Parts

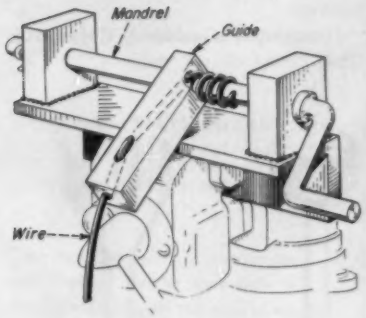
Anyone who has ever tried to clamp round or angular work to a machine table has undoubtedly at one time or another experienced difficulty. The illustration shows an example of round-part clamping, utilizing a self-seating pad and applied with a slightly modified strap.

To obtain maximum traction, a segment broken off an old coarse file made an excellent non-slip pad for a rough casting surface. A dowel pin or a short length of rod was arc-welded to one face of the segment to act as pivot axis. This pivot was then seated in a half-circular groove machined across the nose end of a strap.

The groove may be milled in the strap, or if more convenient, it may be drilled into two straps at once by clamping them face-to-face and drilling a hole at the joint line.

H J Gerber, Stillwater, Oklahoma

Spring Winder is Hand Powered



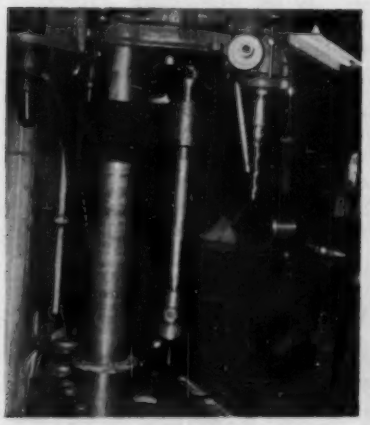
In our field of jig and fixture production we often need a few compression springs in a hurry. There was a time when we used a small lathe available for just such jobs, but since all machines have become occupied we have made a hand-operated spring winder.

It's a self-contained fixture that is gripped in a bench vise when used. The piano wire is inserted through a hole in the mandrel, in much the same way as in other methods. While the crank is turned, the wire is fed to the mandrel through a guide which governs the pitch of the coil.

The framework of the winder is made by mounting two mandrel-support blocks on a length of angle iron. These blocks are drilled and reamed for the mandrel before they are attached to the angle iron. They can be secured either by screws or by welding.

Because our requirement is for springs of only one ID, the mandrel we use is a one-piece crank and mandrel job. If springs of various dia are desired, the crank can be made separately with a hole in its end to receive the mandrel. Reducing bushings would also have to be made for the outer steadyment bearing with bores to suit the various mandrels. The retaining washer and cotter pin would also have to be relocated. They can be placed on the inside end of the crank instead of the extreme end of the mandrel.

Keedar Nath Gupta, New Delhi, India



Tapping Attachment Fits Drillpress

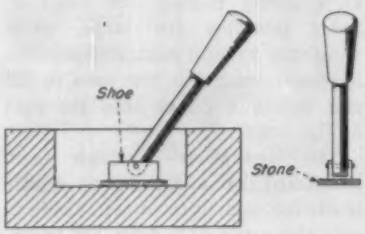
We have devised what we think is a unique and handy tapping attachment, because it makes use of a drillpress column and table. It can be swung into operating position in a matter of seconds, and can just as quickly be swung out of the way when not needed. Thus disposed of, it will not interfere with the regular operations of the drillpress.

The attachment arm was fabricated out of aluminum with the two bores machined in one setting to assure parallelism. The center-to-center distance of the bores was made the same as the centerdistance of the column to the drillpress spindle. This made for quick tapping expediency. Let's say we have a workpiece clamped to the table; the tap size hole is drilled, the clamp screw on the table is then loosened and the table swung over, locating the work under the tap. The hole is then tapped with the least amount of handling.

In contouring the outside dimensions of the arm, a lug was formed and later slit into the column bore. A hole drilled through the lug received a ½-in. capscrew with a handle nut on the protruding threads for quick locking. The smaller bore was fitted with a long drill bushing, purchased for the job. A piece of drill rod was used for the tapping spindle. One end was squared to take a T-handle and the other end tapered to fit a tap chuck.

(Note: A safety collar around the column to support the attachment arm could be a worthwhile addition. It would relieve the operator of supporting the weight of the attachment when it has to be swung in or out.—Ed.)

H G Nicoll, Somerville, Mass



Hinged Stone For Tight Spots

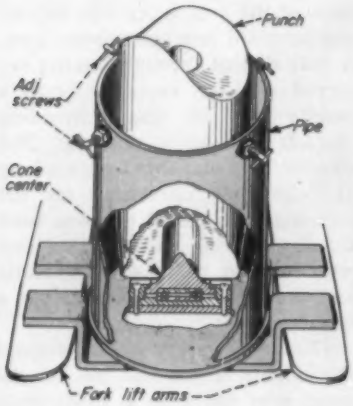
Filing a deep cavity with proper die-sinking riflers can be irritating enough, but if that same cavity has to be stoned the job becomes downright annoying. At least, it used to annoy me until I made the hinged stone holder shown. It takes only a few minutes to make but saves many hours of unpleasant labor.

I made the handle out of a piece of available steel rod, onto which I pressed a file handle. The shoe was milled to a U-shape from a short piece of key stock. The two parts were hinged together by a small pin so the handle could swing 180°.

An oil-resistant cement was used to attach the stone to the shoe, allowing the stone to be rinsed in kerosene when it starts filling up.

J W Rengert, London, England

PRACTICAL IDEAS



Fixture Simplifies Punch Installation and Removal

To install or remove large deep-draw punches is a problem as well as a safety hazard. As many of these punches are large, some weighing several hundred pounds, it would require a few men to lift and install a punch into the ram of the press.

This operation has now been simplified by a fixture or cradle made for each such punch. Made to suit the arms of a fork lift truck, it has eliminated manual lifting. It also protects the punches while in storage because they are left in their individual fixtures when not in use.

The fixture shown is made of a 12-in. length of 9-in. pipe welded to a plate which rests on two bars of steel, ¾ in. by 2 in. These bars are bent as shown to form a 4-in. offset, permitting arms of fork-lift truck to pass under when lifting fixture from the floor.

A ball-bearing cone centers the punch in the bottom of the fixture and allows free rotation of the punch when it's screwed into the punch adapter. Four ⅜-in. brass screws are used for adjusting the punch into a vertical position, aligning it with the adapter.

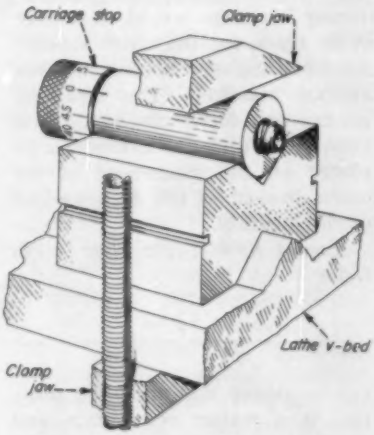
With this fixture one man with a fork-lift operator can install or remove even the largest punches with ease and safety.

Abram Hill, Philadelphia, Penna.

Micrometer Carriage Stop Utilizes V-Block

Some of our lathes are without carriage stops, making it difficult to maintain accurate depth of bores or length of turning work. Fortunately, our lathes are all V-bed jobs. This made the application of the illustrated arrangement easy, besides being fairly rugged and dependable.

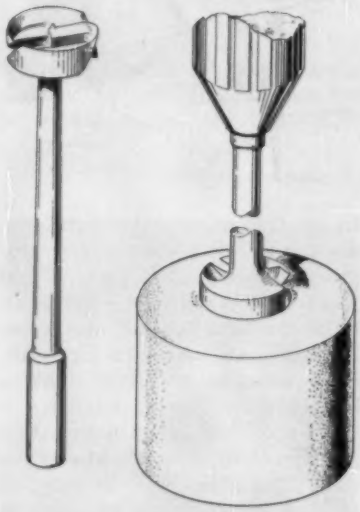
The micrometer stop is first made by drilling and tapping a hole through a piece of bar stock. The dia of the hole is not important, so long as 20 tpi are used. A screw is then made to suit the



tapped hole. It should include a round head which is knurled at the outer end, and marked off in 50 graduations around the periphery of the other end. Thus, each revolution of the screw represents 0.050 in. A zero line is stamped on that end of the bar mating with the graduations on the screw head.

This simple design provides for fine adjustment only. The head of the screw should be kept close to the zero mark so adjustments can be accurately made. Rough settings are made when the stop is placed in one V of a double-sided V-block with the other side of the block straddling the V-bed. The stop and the V-block are arranged on the lathe bed, location determined by gages or inside micrometers, and secured by a husky parallel clamp. Fine adjustment with the screw follows.

Dwayne W Goddard, Columbus. Ohio



Clean Holes Drilled in Rubber

A few rubber strippers were needed for the punches in a temporary die. I wanted neat clean holes and as true to size as possible. Knowing this to be practically impossible with ordinary bits or drills, I tried experimenting with forstner-type woodworking bits.

The results were gratifying. These bits cut clean holes, only slightly under the size of the bit, allowing the rubbers to be pushed onto the punches with enough friction to hold them in place.

Charles H Willey, Penacook, N H

Welding Saves Casting

When an outer race of a bearing is so tightly installed that it is difficult to remove without damage to the bore in the casting, an electric-arc bead run around the inside will help. When the race has cooled, the contraction of the metal will allow the race to be lifted or dumped.

Stanley Clark, East Bradenton, Fla

PRACTICAL IDEAS

RICHARD MINSER
Cleveland, Ohio

won **$25** in addition to regular payment for his idea:

SPLIT RING STAYS ROUND

in the June 3, 1957 issue

An extra $25 will be paid for the best Practical Idea in each issue of *American Machinist*. Selection of the winner is made by a group of our readers.

Our annual Production Planbook will reprint all winning ideas as a review. One will be chosen out of this issue as a winner of winners, and will receive a

GRAND PRIZE OF $100.

JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer, or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

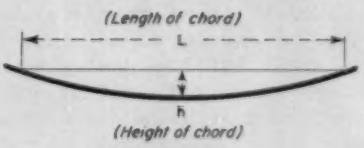
HOW TO ENTER — Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N. Y.

Depth Micrometer Finds Radius

We sometimes have to find the unknown radius of a part without the benefit of its center, such as the segment shown. A depth micrometer may be used for this purpose if its measuring rod is modified by grinding the contact end to a point or semi-sphere.

Before the micrometer can be used, a couple of checks have to be made. First, it must be established that the measuring rod is in exact center of the beam. If not, the long end is ground down to match the short end. A few thousandths removed will not impair the micrometer.

Next, the measuring rod is zeroed out. When this is done, the exact length of the beam is determined with an outside micrometer. This measurement recorded will be the length of the chord in subsequent calculations. A measurement of the height of the chord is then taken by placing the depth micrometer on the part as illustrated.

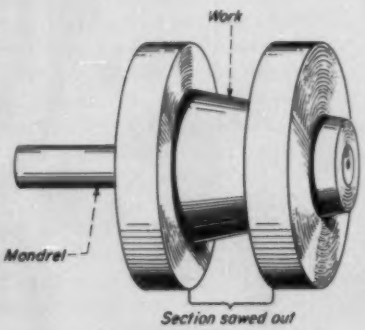


The ratio of $\frac{h}{L}$ is then used to find a constant with which this ratio is multiplied to give the actual radius of the arc. The quickest method would be to refer to the "Table for Finding Radiuses of Segments" in the *American Machinist Handbook*, Sec. 44, page 44. The radius can also be figured by the following formula:

$$\text{Radius} = \frac{h^2 \text{ plus } (L \text{ of chord} \div 2)^2}{2 \times h}$$

The time spent in adapting this instrument will be amply repaid during the times it will be used for the purpose just described.

H J Gerber, Stillwater, Okla



Ring Gages Spot Error in Taper

We have used the taper gage design shown for several years and have found it reliable. We think it's easier to use because the space between the rings, or the overall distance of the rings, will quickly spot any error. Calipers, inside micrometers, or Go-No Go gages can be used for checking the space between the rings. A standard outside micrometer is all you need to check the over-all dimension.

A pair of gage rings is made by first boring a standard or specialized taper into a piece of good-quality steel. It is then turned around and faced off to a desired length, allowing for surface grinding. The center section is then sawed out to produce the two rings. These should also be ground on their facing sides if they are intended to be used with inside micrometers on Go-No Go gages.

L O Caldwell, Tulsa, Okla

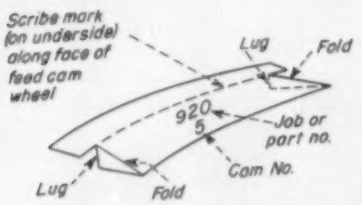
PRACTICAL IDEAS

Photo And Templet Save Time

Before we dismantle a setup in our Cleveland A automatics we do two things in addition to writing out the usual records of tool and cam positions. We take one or two closeup photos of the setup. With pictures as visual reference, the setup man can quickly re-familiarize himself with the arrangement of work and tooling, should they be required at a later date.

In addition to the photos, we make metal templets for setting the feed cams. These, we have found, are more certain and faster to use than translated measurements from records. The templets and photos are filed with the setup data.

The templets are made of sheet iron, about two inches wide by a



length equal to one of the feed-cam segments. Each templet is stamped with the job number and the number of the segment. As indicated in the sketch, a templet is made by holding the sheet iron securely against the cam face while scribing underneath along the edge of the cam wheel.

A ¼ in. cut is made from each end along the scribe line. The cut metal is then bent down to form lugs which butt against the cam-wheel face when setting the cam. Thus, the templet is used to push the loose segment into proper position where it is secured.

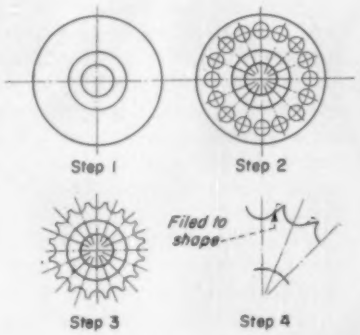
Lew Suverkrop, Bakersfield, Calif

Rubber Cup Collects Grit

Considerable cleaning-up time can be saved when honing engine cylinders if you use a rubber cup to collect the grit and honing dust. We make a rubber cup by cutting a hollow toy rubber ball in two halves. The ID of the half ball should be a bit larger than the dia of the cylinder.

We place one of these half balls at the bottom of the cylinder to be honed, and then turn the crank up to hold it in position. The cup will then catch most of the loose hone dust and grit.

H Muller, Danboro, Penna



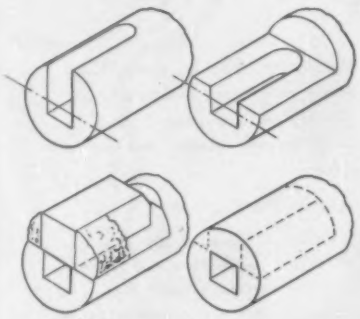
Ratchet Made By Substitution

Called to do an emergency repair job on a textile mill, I found a small but important ratchet wheel worn out and the only equipment available was a lathe and a small drillpress. As the mill was holding up production it had to be put back in operation as soon as possible, which ruled out going back to the shop to make the wheel.

First a blank was turned, including a boss on each side and a bore. Sixteen ¼-in. holes had to be drilled in a 1½-in. bolt circle so the OD was turned well above this dia to insure enough stock for drilling. The holes were then drilled and the blank was again chucked and turned down to 1½ in. dia. One side of the material left between each hole was then hand filed to form ratchet teeth.

Keeping in mind that the hole locations are the governing factors of accuracy, (bolt circle dia, concentricity, and distance apart) sprocket gears can be made in the same manner.

Jack Schofield, Preston, Lanc's, England



Welded Box Wrench

When we want to make a square hole in the end of a shaft (to be used as an extension for a tap or a wrench) without forging or broaching facilities, we proceed as follows:

A slot is milled in the shaft, parallel to its axis. To properly centralize a hole, the slot should be milled to the required width, and the depth should be half the width below the centerline. Half the width above the centerline is milled flat for a distance equal to the length of the slot. A piece of rectangular stock, slightly wider than the slot, is arcwelded over it.

For additional strength, it is advisable to scarf the shaft and the end of the rectangular piece. This gives the weld a better chance to penetrate. The shaft is now dressed or turned to smooth the weld, and if the welding is good it will be difficult to tell how the hole was produced.

Arthur Drummond Jr., Memphis, NY

American Machinist
Special Report No. 448

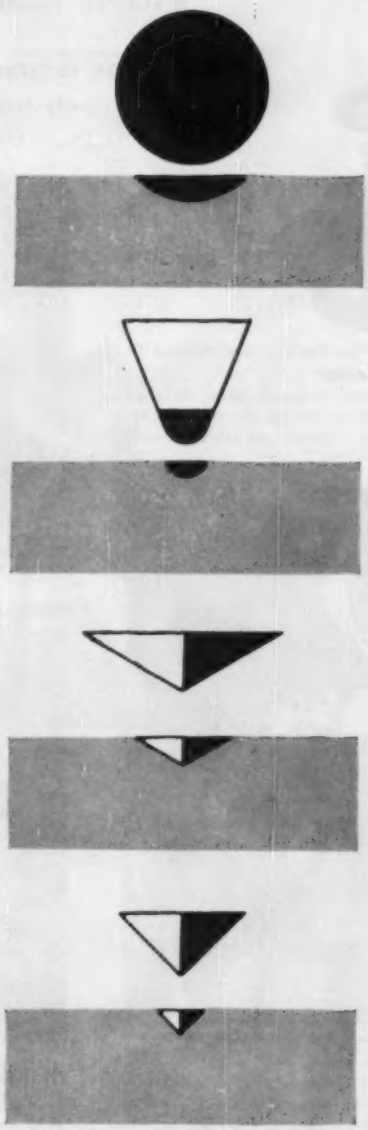
how to apply

HARDNESS TESTING IN THE SHOP

VINCENT E LYSAGHT
Wilson Mechanical Instrument Div,
AMERICAN CHAIN & CABLE CO, INC, NY

Did you know that "hardness" cannot be clearly defined by statute or the laws of physics? However, even though there is no basic reference or standard for hardness, the term "hardness testing" is known throughout the metalworking industry. You, the production man, and your co-worker, the metallurgist, are both vitally interested right now in hardness testing. The chances are that your interest will grow. Why? My answer must make two points. First, hardness bears a relationship to tensile strength, wear resistance and toughness. Therefore, hardness tolerances are found in specifications for metals in the forged, cast, rolled, heat-treated and plated conditions, either to measure quality or to aid further fabrication. Second, hardness testing is rapidly moving into the field of quality control—in the shop.

In addition, you will find that hardness testing now covers a great deal more ground than it did a few years ago. To keep pace with the trend, testing machines and work-supporting fixtures have been developed in wide variety, to suit production needs as well as those of the laboratory.



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Hardness tests indicate quality

Since 1900, when Dr J A Brinell described his ball test for hardness, there have been many attempts to correlate hardness with other properties of materials. Certainly, hardness testing is now perhaps one of the most widely used and universally accepted methods of non-destructive testing. When other essential factors besides hardness are known, important questions about a material can be answered in a reliable manner. Examples: the quality of heat-treatment; the strength of materials. In short, experts now consider hardness testing to be essential in practically all manufacturing operations.

RELATION TO OTHER TESTS

The tensile test often furnishes a criterion of proper quality for best performance of forgings, cast iron, low alloy steel, and annealed carbon and alloy steels. For such materials, there is a satisfactory relationship between the hardness test and tensile test. In ferrous materials, the hardness *vs* tensile relationship may be determined within a possible error of ± 10 per cent.

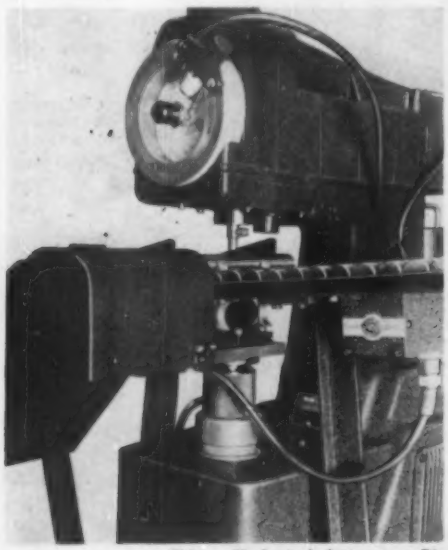
If the hardness test is applied beyond the foregoing general applications, great care must be used and many factors taken into consideration. Under certain conditions, hardness testing may indicate machinability, toughness, wear resistance, fatigue strength, etc. In rough turning, the hardness test may be used as a machinability index for any one steel, but beyond that it is not advisable to rely upon the test too heavily.

Tinius Olsen Testing Machine Co

Brinell hardness tester . . .
generally is a hand-operated hydraulic press designed to force an indenter into the workpiece or test specimen. Hardness values or numbers are taken directly from a table

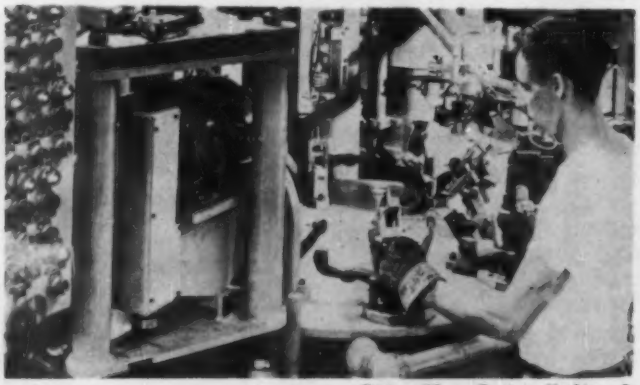
Wilson Mechanical Instrument Div, American Chain & Cable Co.

Rockwell hardness testers . . .
are customarily used for most production testing applications



Wilson Mechanical Instrument Div

Fully automatic . . .
Rockwell hardness tester takes work from a vibratory feeder and classifies pieces into too soft, too hard or correct classifications at the rate of 1000 per hr.



Tinius Olsen Testing Machine Co

Dial-feed . . .
automatic Brinell hardness tester is installed in production line for testing 10-lb rocker arms. Production—1000 pc per hr.

Hardness tests do not provide a reliable index for the evaluation of wear, except where the results are compared for parts of the same composition. Under such conditions, the greater the hardness, the more resistant is the metal to wear. The same conditions prevail in the relationship between hardness and toughness, except that toughness increases as hardness decreases.

Different companies utilize hardness testing for various reasons. What may suffice for one manufacturer, such as hardness tolerance or limits, speed of test and depth of penetration, may not be satisfactory or practical for another. Some use the hardness test to check adherence to specifications, others for process control. Some are interested in hardness if there is a reliable correlation with tensile values, while others want to predict fabricating properties. Many use the hardness test for quality control; other use it for determining the hardness of a material as related to fundamental properties of the material.

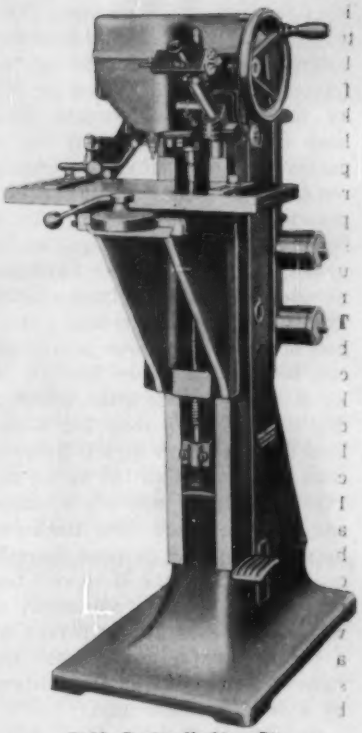
Several factors must be considered if hardness testing is to be successfully performed:

First, the tester must be in good operating condition. In the Rockwell tester, calibration is made against standard test blocks. No two machines read exactly alike nor is a piece of steel that forms a test block exactly homogenous.

Second, care and judgment must be exercised in outlining hardness specifications. Limits that are too close place hardship on the producer and may be beyond the range of accuracy of the testing equipment. Too wide a limit may result in an inferior product.

Wilson Mechanical Instrument Div

Rockwell superficial hardness tester . . . is applied to testing sheet metal and small nitrided or carburized parts



Riehle Testing Machines Div

Vickers hardness tester . . . uses 136° diamond pyramid, operates like the Brinell machine, is used on specimens mounted in plastic or clamped

Wilson Mechanical Instrument Div

Very shallow indentations . . . are made by the Wilson Tukon tester, for determining hardness of thin materials or superficially hardened surfaces

The Scleroscope . . . is often used when an instrument must be brought to the work. Rebound of a ball from the work surface is an index of hardness

Shore Instrument & Mfg Co

HARDNESS TESTING EQUIPMENT

Commonly used testing machines for determining resistance to permanent indentation are the Brinell, Rockwell and Rockwell Superficial, and Diamond Pyramid hardness testers. They are commonly known as indentation-hardness units.

The Brinell—The hardness number is the ratio of applied load in kilograms to surface area of the indentation. This tester generally consists of a hand-operated hy-

draulic press designed to force an indenter into the specimen. The test is made with a 10-mm diamond ball under a load of 3000 kg for ferrous metals and a load of 500 kg for non-ferrous metals. This load is generally applied for a period of 30 sec. After the load is removed, the diameter of the impression is measured with a microscope containing a scale graduated usually to 0.1 mm. The hardness number may be taken from a table.

The Rockwell—In this test, a steel ball or a diamond cone penetrator can be used. A minor load of 10 kg is applied first, after which a dial gage is set to zero. The major load (normally 150 kg for diamond cone penetrator and 100 kg for the 1/16-in. ball penetrator) is added and then removed. The Rockwell hardness number is read directly on a dial. Thus, the Rockwell test measures the additional depth to which a cone or ball is driven by a heavy (major) load after the same penetrator has been driven by a definite minor load.

Several Rockwell scales cover the range of hardness of various metals. Each scale is designated by an alphabetical letter associated with a specific major load and penetrator. Major loads are 60, 100 and 150 kg; their penetrators are the 120° diamond or "Brale" penetrator with an 0.2-mm radius truly tangent to the cone, and ball penetrators of 1/16, ⅛, ¼ and ½-in. diameter.

The combination of diamond penetrator called a "Brale" and 150-kg major load is known as the C scale. It is used for testing all hardened and heat-treated steel. The B scale is the combination of the 1/16-in. steel-ball penetrator and 100-kg load. It is utilized for the testing of unhardened steel, brass, bronze, etc.

Fully Automatic Rockwell — During the past year, great strides have been made in perfecting high-speed methods of testing the hardness of metals. In the foreground was the development, with many new concepts, of completely automatic hardness testing of small, but not intricate, mass-production gears, splines, tools, etc.

Of equal importance was the development of a high-speed automatic Rockwell hardness tester. This machine is equipped with a vibratory hopper for automatic loading, and it sorts pieces into three classifications—too hard, too soft, or satisfactory—at a rate of up to 1000 pc per hr.

Fully Automatic Brinell—A new Olsen development is an automatic go—no go Brinell hardness tester for production-line testing of odd-shaped automotive rocker arms weighing 10 lb. Tests are conducted at rates of up to 1000 pc per hr.

The operator places two parts at a time in the holder on the periphery of the large circular work table. Movement of the table is controlled by a pre-set timer. The table automatically rotates a quarter turn to the grinding station, where a small, smooth area is ground by twin grinding wheels.

The parts are then moved to the second station where a standard Brinell load of 3000 kg is applied on the ground surface. At the same time, the depth of the impression in each of the two parts is measured electrically with extreme accuracy. The depth readings are transmitted to the go—no go memory units of the third station.

Without manipulation by the operator the Brinelled parts are picked up individually and either sent to the next operation via a conveyor belt or dropped into the reject pile, according to the hardness. The factor of human error is completely eliminated.

Rockwell Superficial—A specialized form of the Rockwell tester operates on the same principle as the normal model Rockwell tester. However, the minor load is reduced to 3 kg and the major load to 15, 30 and 45 kg. The same 1/16-in. ball penetrator is used on brass, bronze and unhardened steel. On hard surfaces, a diamond N "Brale" penetrator is employed.

This superficial tester has its own scales. They are designated first by the value in kilograms of the smaller load used; second by a letter (N if the diamond penetrator is used or T if the 1/16-in. penetrator), and third by the dial reading.

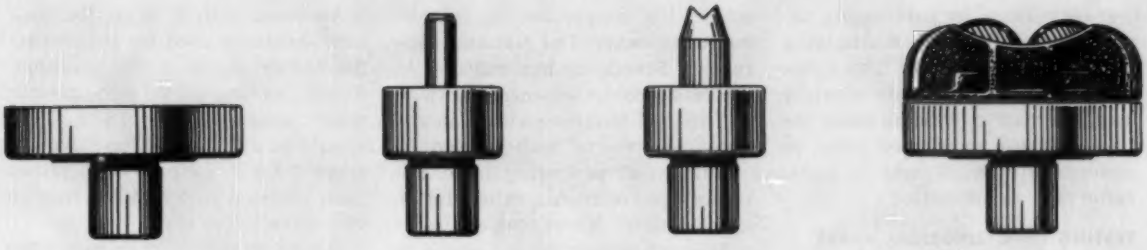
Diamond Pyramid—The 136° diamond pyramid hardness test,

Ames Precision Machine Works

Richle Testing Machines Div

Barber-Colman Co

Portable hardness testers . . . are used in many shops. Two of them, the Ames (*top*) and the Richle (*center*) test work at a relatively short distance from the edge of large workpieces. The Barcol Impressor can measure hardness at the center of large plates or bulky pieces



Supports for workpieces . . .
are necessary in many testing procedures. Here is a complete set of standard anvils for the Rockwell tester

commonly referred to as "Vickers," follows the Brinell principle in that an indenter of definite shape is pressed into the material under a selected load. When this load is removed, the resulting impression is measured and the hardness calculated by dividing the load by the surface area of the indentation. Loads up to 50 kg are generally used.

The average length of the two diagonals is measured with a microscope and the hardness calculated from formulas or by reference to a table. This test is used for research work and on sections of odd shape that must be mounted in bakelite or clamped for testing.

Microhardness — Although microhardness testing is not a production-line technique, certain hardness information can be determined only by this method. Example: the hardness at the extreme end or tip of a cutting tool.

According to usage in this country, microhardness testing refers to testing thin materials down to 0.0005 in., testing fine-diameter wire and extremely small precision parts, determining hardness gradients in superficially hardened surfaces, exploring hardness variations over small areas, and determining the hardness of different constituents of metals. Chrome plate, thin nitrided cases and cyanide cases less than 0.001 in. deep may be accurately measured for hardness of the case itself.

Microhardness testers fall into two groups: those representing the scratch method and those operating on the indentation principle. The Wilson Tukon tester, Model IR, is in general use in industrial laboratories and research departments. This unit, which can also be used for heavy-load macrotesting, applies loads of 10 to 50,000 grams.

Scleroscope—A dynamic form of hardness tester, the Scleroscope is often used for testing large workpieces, especially where the instrument must be brought to the work. A diamond-faced hammer is dropped within a glass tube onto the surface of the specimen being tested. The height of rebound on an arbitrarily marked scale is an indication of the hardness value.

Portable Hardness Testing Equipment—Generally, portable units are not as accurate as bench testers. However, if the part cannot be tested in a more accurate machine, because of size, shape or location, a test determined on a portable unit may be of considerable value.

Portable testers fall into two groups. One is of gooseneck design, which takes work up to a given must not be too close to each other thickness and tests inward from the edge of the piece a relatively short distance. The Ames, Webster, King, and Riehle testers are in this group.

The second category of portables consists of machines that measure hardness at or near the center of large sheets and bulky workpieces. The Barcol Impressor, the Poldi, and the Ernst are perhaps typical of this classification.

PRECAUTIONS WHEN MAKING TESTS

Many factors affect the results, or readings, when an indentation hardness test is made:

1. Normality of test surface to load. For most work, angles of less than 5° will not affect results.
2. The material must be secure; it must not rock or shift under load.
3. The time that the specimen is under full load.
4. The rate of load application.
5. Spacing of indentations. They must not be too close to each other or to the edge of the work.
6. The specimen must be homogenous unless the test is being made to determine decarburization, segregation or inclusions. The grain size must also bear proper relationship to size of the impression.
7. Conditions must be such that work hardening is not introduced when preparing the sample.

Things to watch in hardness Testing

In addition, three important phases of hardness testing must be watched closely. They are: testing sheet metal, testing cylindrical parts or components, and using standard conversion tables.

TESTING OF SHEET METAL

In both the Rockwell and Brinell tests, the thickness of the piece should be such that no bulge or other marking appears on the side opposite the impression. All tests must be made on a single thickness. The measurement of several thin sheets totalling ⅛ in. thick will not yield the same reading as that of a ⅛-in. solid sheet. Usually, if the thickness of the piece is 10 times the depth of the impression, the results are not appreciably inaccurate.

The approximate depth of indentation can be obtained from a

C-scale reading by subtracting the reading from 100 and multiplying the result by 0.00008 in. This value does not include the depth of minor load indentation. In some cases, the 10-to-1 ratio mentioned may be unnecessarily high and a lower value may be permitted.

TESTING OF CYLINDRICAL PARTS

Because of curvature of the specimen, the hardness value may be reduced. In the Brinell test, error may be kept to a reasonable value if the two principal diameters of indentation are averaged and if the minimum radius of curvature is equal to, or greater than, five times the radius of the indenting ball.

In the Rockwell test, the error may be of considerable magnitude if the diameter of the material is less than ½ in. Under such conditions, the piece diameter should be specified because the results are comparative only for rounds of the same diameter.

CONVERSION OF HARDNESS SCALES

The Brinell test is used for testing cast iron, while the Rockwell is principally utilized for testing sheet metals, heat-treated steel, finished ferrous and non-ferrous material.

Often, it is desirable to convert from one hardness value to another. No conversion is mathematically exact. The National Bureau of Standards has determined the relationship between Rockwell and Brinell numbers within an anticipated error of ± 10 per cent.

The safest procedure is to test under the conditions called for in specifications. Never convert hardness readings from one scale to another in the case of thin material, if the metal cannot be properly tested with both kinds of instruments. Conversion tables have been established by testing thick specimens and are valid only for such specimens. Use conversion on flat surfaces only.

Support of Workpiece

A fundamental requirement of the Rockwell test is that the surface being tested be approximately normal to the penetrator and that the piece not move or slip as the major load is applied. The support itself must be of sufficient rigidity to prevent permanent distortion in usage.

Sheet metal, small pieces, or pieces without flat undersurfaces are tested on an anvil having a small, elevated, flat bearing surface. Pieces that are not flat should have the convex side down on the bearing surface.

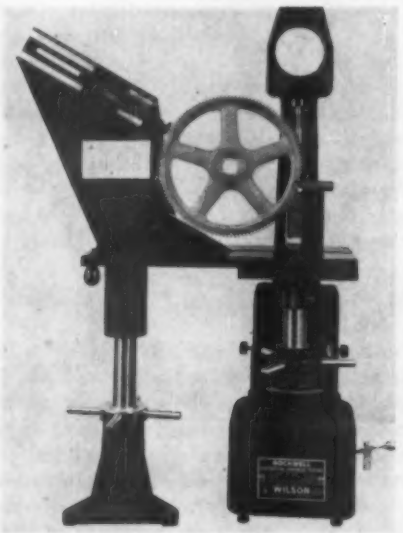
An anvil with a large, flat surface should be used for supporting flat-bottom pieces of heavy section. Anvils having a surface greater than approximately 3-in. dia should be attached to the elevating screw by a threaded section rather than inserted in the anvil hole in the elevating screw.

Round work should be supported in a hardened V anvil or in a "Cylindron" anvil which consists of hardened parallel twin cylinders. When small rounds are tested it is essential that the center of the V be aligned with the center of the test point and that the piece be straight.

Tubes and hollow pieces must be supported by a mandrel to insure their rigidity under test loads. Any permanent deformation under application of major load will introduce an error into the readings.

Production-line testing is not necessarily limited to small pieces and/or simple shapes. Often tests must be made in relatively inacessible places, as for example, on the face of a gear tooth. This is accomplished with an adjustable fixture designed to hold gears in position while the hardness of the tooth face is checked.

On the whole, irregular-shaped pieces must be properly supported on specially designed fixtures. To

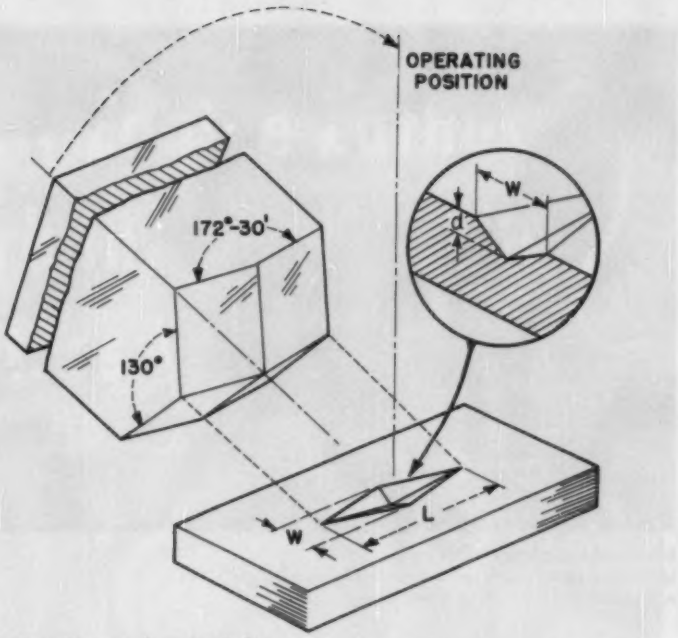


New fixture for gear-tooth testing . . . at pitch line locates the gear by a positioning anvil designed to compensate for DP and a sliding wedge. The cam-lock clamp compensates for gear diameter. In this setup, the gear is locked tightly while the Rockwell test is made

TABLE 1—Minimum Material Thickness Tested with Various Rockwell Scales

Minimum Thickness In.	Superficial Tester*			Standard Tester†		
	15N	30N	45N	A	D	C
	15Kg	30Kg	45Kg	60Kg	100Kg	150Kg
0.006	92	—	—	—	—	—
0.008	90	—	—	—	—	—
0.010	88	—	—	—	—	—
0.012	83	82	77	—	—	—
0.014	76	80	74	—	—	—
0.016	68	74	72	86	—	—
0.018	X	66	68	84	—	—
0.020	X	57	63	82	77	—
0.022	X	47	58	78	75	63
0.024	X	X	51	76	72	67
0.026	X	X	37	71	68	65
0.028	X	X	20	67	63	62
0.030	X	X	X	60	58	57
0.032	X	X	X	X	51	52
0.034	X	X	X	X	43	45
0.036	X	X	X	X	X	37
0.038	X	X	X	X	X	28
0.040	X	X	X	X	X	20

* Diamond N Brale penetrator † Diamond Brale penetrator
X material ordinarily tested with 1/16-in. ball penetrator



Surface hardness of materials . . .
thinner than 0.005 in., thin cases 0.001 to 0.002 in. thick, and crystals in materials can be measured with the Wilson Tukon microhardness tester. The indentation made with a Knoop indenter (shown) or the 136° diamond indenter, is so small that it must be measured with the metallurgical microscope built into the tester

accomplish this end, special fixtures, penetrators, penetrator extensions, goosenecks and even special machines have been designed. These fixtures should be designed, wherever possible, to allow their use on several parts.

HARDNESS TESTING FOR QUALITY CONTROL

In production hardness testing, especially on heat-treated steel parts where Rockwell specifications must be translated into inspection procedure, more and more companies are resorting to statistical methods of quality control.

A quality-control system should start with a study of the precision to be expected from the hardness-testing equipment.

Experience has shown that an average of six readings on one Rockwell tester in good condition, when testing well-controlled steel of C-scale hardness, will be within ± 0.5 point of the "true" hardness.

PRODUCTION USES

In automotive work, parts which have been hardened and tempered require hardness inspection. This testing provides a check on the best treatment to make certain that specifications have been met. Thus, failure of the part in service is prevented. King pins, valve tappets, gears and camshafts are among the parts requiring 100% quality-control inspection for hardness.

One supplier, for example, has kept a minimum of 6 Rockwell testers busy more than 20 yr on two 8-hr shifts in testing both chilled iron and heat-treated steel tappets. The average number of tests is 600 per hr per machine. On motorized testers as many as 725 tests per hr have been made over extended periods. This all adds up to approximately 1,150,000 tests per year on each machine.

Gear-cutting hobs are always tested 100% by a prominent tool manufacturer. These cutters are heat-treated in the most modern equipment. Spot checks of the hardness on properly prepared surfaces are made on a few pieces in each batch while in the heat-treat room. If sample parts are within specified limits, the entire batch is finished, ground and then tested 100 per cent.

CASE-HARDENED STEELS

In testing case-hardened material, the depth of case must be sufficient to support the penetrator properly. The case depth should be at least 10 times the depth of indentation. Because the depth of indentation at Rockwell C63 is less than 0.003 in., the case depth should be at about 0.030 to obtain a true Rockwell C scale reading.

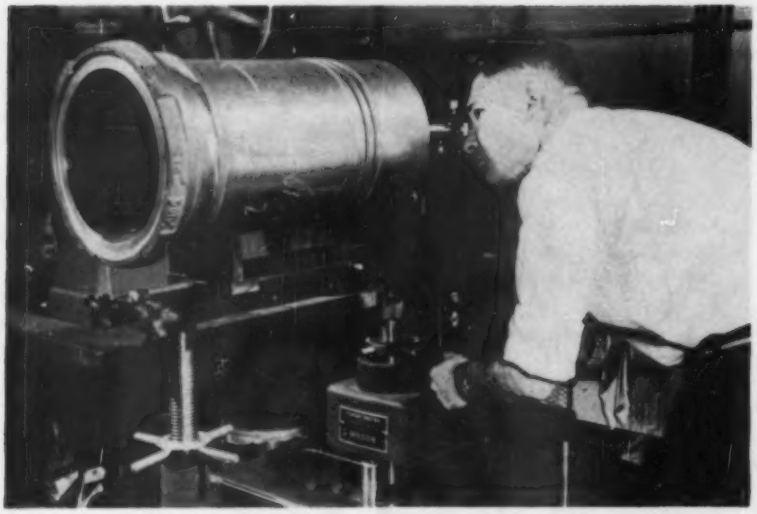
DECARBURIZATION

To check for decarburization in heat-treated steel, two tests are made: one with the 15N scale of the Rockwell superficial test and the other with the C-scale of the normal Rockwell test. If the equivalent Rockwell hardness is not obtained by conversion, a soft decarburized surface may be present. Decarburized surfaces 0.004 in. or deeper may be detected in this manner.

NITRIDED AND THIN CASE-HARDENED SURFACES

If a case is only 0.005 to 0.010 in. thick, it must be tested by either the Rockwell superficial method or the 136° diamond pyramid test.

Surface hardness less than 0.005 in. generally cannot be determined by the depth-measurement method. The Vickers tester with a load of 1 to 5 kg or the Wilson Tukon



Chromium-plated liners . . .
for Alco engines are checked for microhardness on a Tukon tester, which is mechanically operated

tester, is used for measuring the hardness of such thin cases. Where cases are in the neighborhood of 0.001 to 0.002 in., the microhardness tester is necessary.

FORGINGS

Forgings are generally tested in the Brinell unit. The large impression of the Brinell test is of distinct advantage because it results in an integrated value instead of a very local value as in the case of the Rockwell test. A very close relation exists between Brinell hardness and the tensile strength of forgings.

CAST IRON

Cast iron is generally tested by the Brinell method. The large indentation is an advantage because the material is not uniform. Surface conditions, insofar as hardness is concerned, will be minimized by the deep penetration. In cast iron, a good relationship exists between tensile strength and Brinell hardness values.

The Rockwell tester is used in testing cast iron, where there is insufficient area for the Brinell method. The B scale is sometimes used, but the E or K scale is preferable. Very good Rockwell results are obtained, using the E scale, by removing sufficient metal from the surface of the sample.

Hard white iron castings are generally tested on the C scale of the Rockwell tester, or by the 136° diamond pyramid method. If the material is not homogenous, several readings should be taken and averaged.

MICROHARDNESS TESTING

Microhardness testing covers the testing of very thin material down to 0.0005 in., extremely small parts, thin superficially hardened parts, plated surfaces, add even individual constituents of materials. Chrome plate, thin nitrided cases and cyanide cases less than 0.001 in. deep may be accurately measured for hardness of the case itself.

Static indentation tests are made with a load of under 1000 gr. The indenter is either the 136° square-base diamond pyramid or the elongated Knoop diamond indenter. The size of the indentation, which is extremely shallow, must be precisely determined with a microscope having good resolving power. It is important that the test surface be lapped plane and free from scratches. For tests with loads of 100 gr or lighter, a metallographic finish is necessary.

The Tukon unit is one type of tester used for extremely low loads (as low as 1 gr), although most work is carried out with loads of 100 gr.

The Knoop indenter produces a diamond-shaped indentation having long and short diagonals in approximate ratio of 7:1. The depth of indentation is about 1/30 of its length. To obtain the Knoop hardness number, the load is divided by the projected area of indentation.

With the 136° diamond-pyramid indenter, the depth of indentation is about 1/7 the diagonal length. The diamond pyramid hardness number is the load divided by the surface area of the indentation.

Hardness of plated surfaces has been tested on the Tukon tester:

Metal	Knoop Hardness 100 gr. Load
Cadmium	37
Silver	60
Zinc	120
Copper	165
Nickel	550
Chromium	935

These values should not be considered representative of plated surfaces under all conditions.

From this review of the various hardness testers and the problems relating to their proper use, an idea may be gained of the importance of hardness testing in industry. Modern hardness testers are accurate and remain in calibration for long periods. Proper use of hardness testing in quality control will reduce cost of inspection. Here, the tool engineer can be of tremendous assistance by supplying suitable means to bring work to the operator of the equipment, and proper supports for the work while it is being tested.

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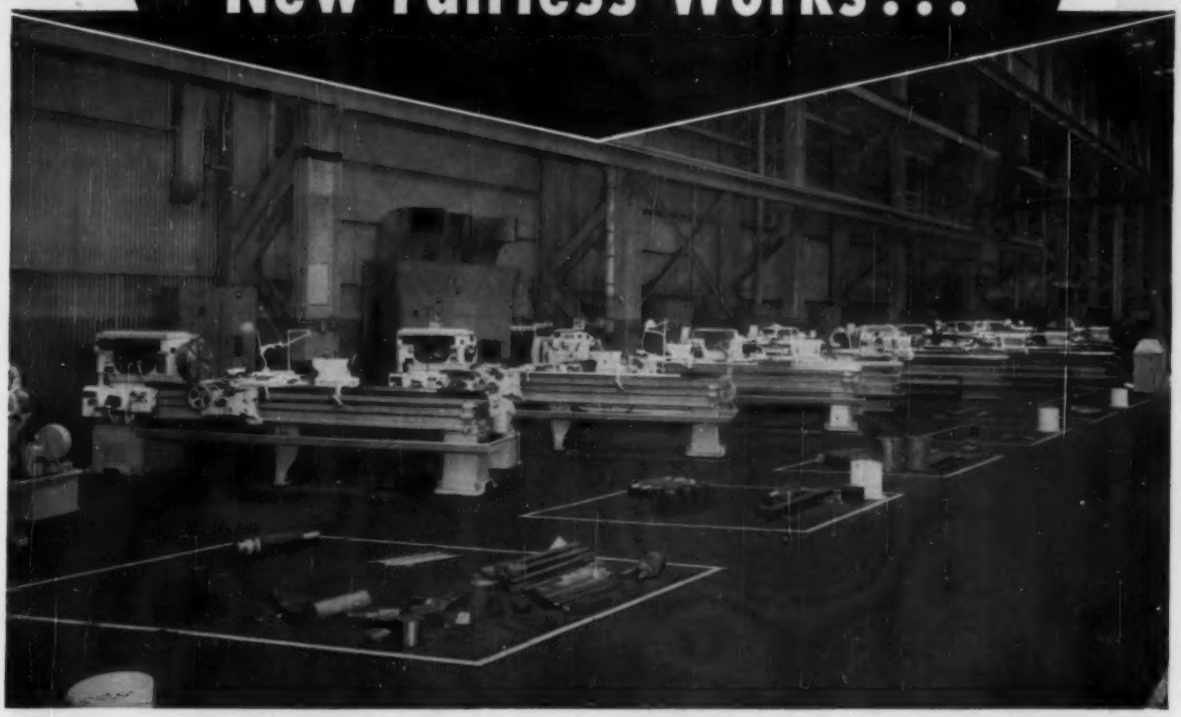
Send to Reader Service Dept, American Machinist, 330 W 42nd St, New York 36, NY, for list of reprints available and prices. Or enclose, with your request for a specific reprint, 35¢ if it is 16 pages, 30¢ if 12 pages, 25¢ if 8 pages. Prices are reduced for quantities over 100 copies.

13 LEHMANN Engine Lathes NOW at work in U. S. Steel's New Fairless Works...



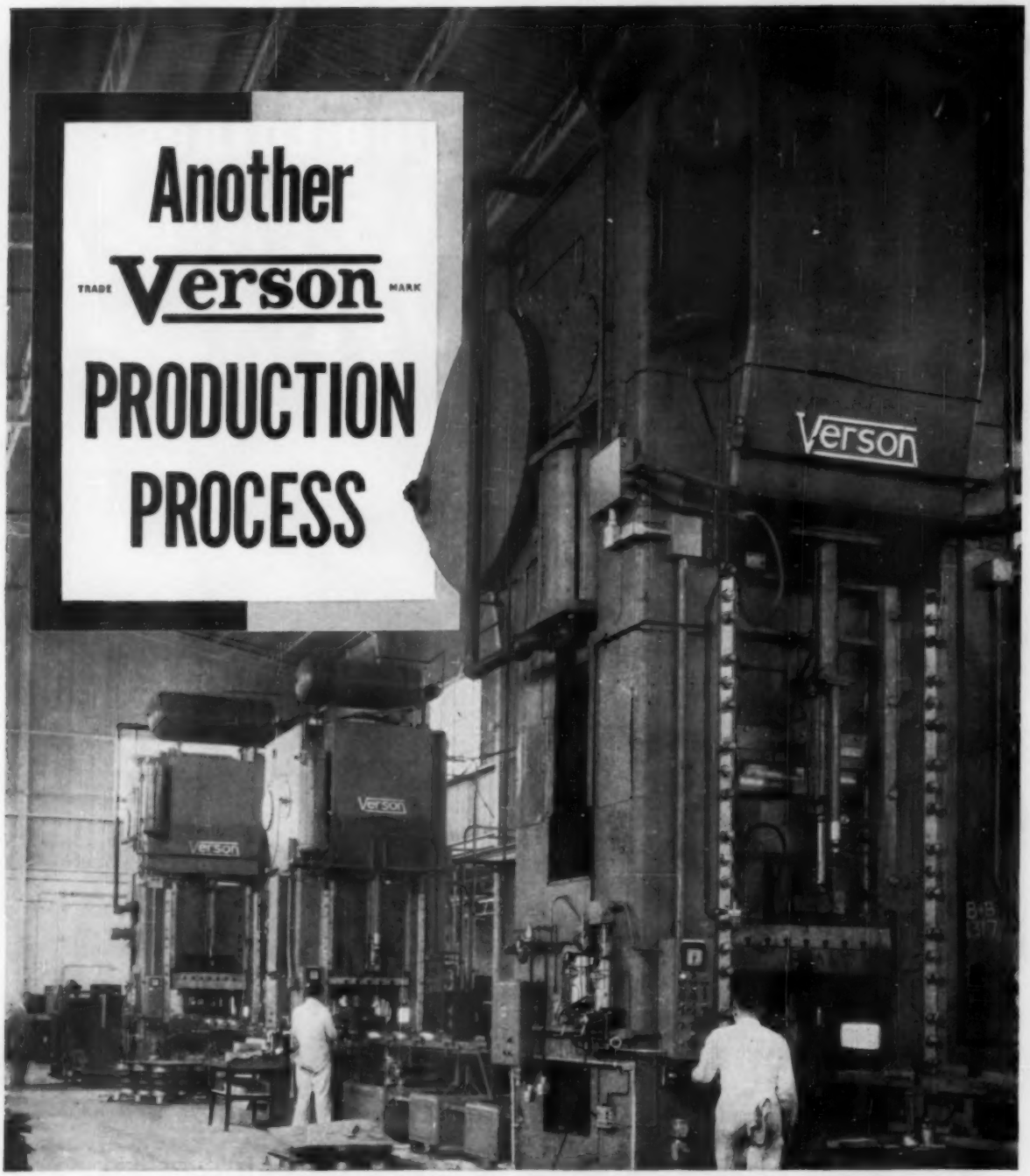
The largest integrated steel mill to be built at one time uses LEHMANN Lathes in its modern maintenance shops!

The Fairless Works, built on 3,900 acres and one of the biggest expansion projects built in our time, incorporates the most modern steel mill equipment available. One of the big jobs at Fairless is that of maintenance. Special shops to keep all the equipment used in this 2.2 million ton plant in top running order are an important part of Fairless.

The machine tools, cranes and other equipment necessary for cleaning, machining and repairing the mill operating equipment (which, in fact, make practically all repairs required at Fairless) include 13 Lehmann engine lathes! Some of these lathes are shown in the above photo.

Find out how Lehmann Lathes can bring efficiency, safety and speed to the operations in your plant. Write today for information or catalog — or — send prints for time and money saving recommendation.

Lehmann · Brandes
MACHINE COMPANY
GRAND at CHOUTEAU · ST. LOUIS 3, MO.



Engineered and Developed by -Verson- to Make Manufacturing More Profitable

Here is a good example of what Verson engineering can do in automated press lines . . . and this is no theoretical concept . . . it is a tried and proven production process which has been in operation for one year.

Three Verson Eccentric Presses (1500, 200 and 600 tons respectively from front to rear in above photograph) are synchronized with automatic transfer and feeding equipment. The part produced is an automotive transmission drive housing.

As a manufacturer of both Transmat and automated press line processes and related tooling, Verson is well qualified to assist you in high production automatic stamping problems. For specific recommendations send an outline of your requirements. 163

VERSON ALLSTEEL PRESS CO. • 9316 S. Kenwood Ave. • Chicago 19, Illinois
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Gall Resistance of Metals..I

These data were compiled by P J Olmstead, chief engineer, Goulds Pumps, with the assistance of G L Cox of The International Nickel Co.

Courtesy Goulds Pumps, Seneca Falls, NY

The chart on page 145 shows the probable galling characteristics of various combination of materials. Either material of a combination may be the stationary or rotating part with no change in the galling characteristics.

The gall resistance of materials is characterized by the following criteria, and the gall resistance increases in the order named:

1. Hardness—such as nitrided or carburized steels.
2. Hardness plus inherent resistance to seizing by formation of silicides, as in "S" Monel, "S" nickel, "S" Inconel, or the like.
3. Inherent resistance to galling as in cast iron, ductile iron, Ni-Resist or "G" Nickel, due to lubricating qualities of graphitic carbon.

Where, and if, possible the following criteria should be used as a guide in selecting and machining materials for gall resistance:

1. Use austenitic against martensitic alloys.
2. Choose mating materials (except bronzes) with a difference in hardness of 50 Brinell numbers.
3. Grind mating surfaces.

Although a combination of materials may indicate non-galling characteristics, consider the possibility of galvanic corrosion arising from the combination of materials and the electrolyte or liquid present.

EXPLANATION OF NOTES, page 145

Note 1: The free-machining grade of "K" Monel, known as "KR" Monel, should have somewhat better gall resistance than "K" Monel, as shown.

Note 2: "S" and "G" nickel have better gall resistance than the regular cast nickel. Both are comparable in gall resistance, but "S" nickel will stand heavier loads.

Note 3: "S" Inconel, a high-silicon variety of Inconel, is superior to "S" nickel and "S" Monel in gall resistance.

Note 4: The Ni-Vee bronzes are 5% nickel—5% tin, cast and heat-treatable, similar in balance of composition to the 88-10-2 Cu Sn Zn type: "A"—No lead; "B"—1% lead; "D"—10% lead.

Note 5: Leaded bronze: 85-5-5-5 or 80-10-10.

Note 6: Nickel aluminum bronze is generally somewhat inferior to Ni-Vee "A" in gall resistance and coefficient of friction, but will stand heavier loads in slower motion.

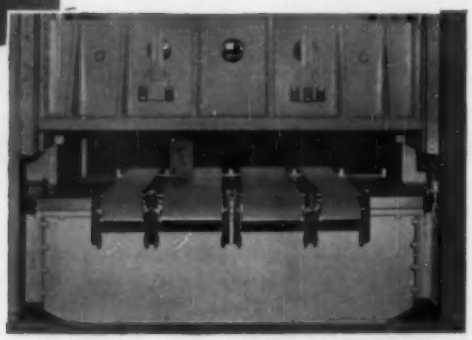
Note 7: Chromium plate varies greatly in gall resistance. To work best, chromium plate must be backed up by hard material, and the plating must bond well to the backing.

This chart was not prepared from an exhaustive study of each combination of metals, under all conditions of galling. The data were first set down 10 years ago from experiences and occasional bits of information. During this period, the chart has proved helpful to people who knew nothing about the subject, and their choices from the chart were reasonably good ones. The current chart incorporates a number of revisions, based on further experience.

The operating ease and convenience that mean *Better Production at Lower Cost!*

Struthers Wells

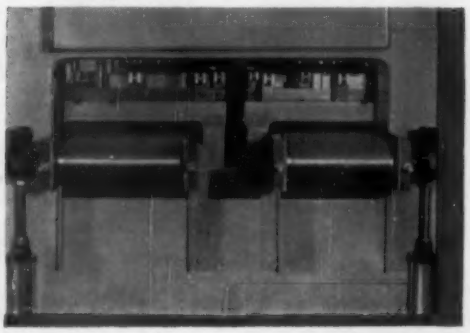
PUNCHING AND NOTCHING MACHINES



Efficient scrap removal is vital to economical production—side or end conveyors are available as specified.

CAPACITIES: 200-300 Tons
SIZES: 36" to 60" front to back
LENGTHS: 96" to 140"

Struthers Wells Punching and Notching Machines have the features you need for productivity and profit! Massive, self-sustaining construction for low deflection and long die life. Off-center loading, permitted by wide gibbing. Left to right or front to back feeds. Good operating clearance for easy die mounting. Positive scrap cutoff *up to 20 ft* with SW die design. • Check these *Struthers Wells* advantages—let us bring you the facts, without obligation.



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MACHINERY for Sheet and Structural Metal Forming . . . Tangent Benders . . . Folding Machines . . . Roller Table and Tumble Die Bending Machines . . . Press Brakes . . . Punching and Notching Machines . . . Forming Dies

Gall Resistance of Metals..II

	Cast Iron	3% Ni-Cast Iron	Ni-Resist (Type 1, 2)	Ductile Iron	Ductile Ni-Resist	"S" Monel	"K" Monel[1]	"B" Monel	"H" Monel	Duranickel	"G" Nickel[2]	"S" Nickel[2]	Inconel	"S" Inconel[3]	400 Stainless (Soft)	400 Stainless (Hard)	300 Stainless Steel	SAE 1000 to 6000 (Soft)	SAE 1000 to 6000 (Hard)	Bronze (Leaded)[5]	Ni-Vee Bronze "A"[4]	Ni-Vee Bronze "B"	Ni-Vee Bronze "D"	Ni-Al Bronze[6]	Hastelloy "A"—"B"	Hastelloy "C"	Hastelloy "D"	Nitrided Steel	Chrome Plate[7]	Stellite
Cast Iron	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
3% Ni-Cast Iron	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Ni-Resist (Type 1, 2)	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Ductile Iron	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Ductile Ni-Resist	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
"S" Monel	S	S	S	S	S	S	F	F	S	S	S	S	F+	S	F	S	F	F	S	S	F	S	S	F	F+	S	S	S	S	S
"K" Monel[1]	S	S	S	S	S	F	F	N	F	F	S	S	N	S	F	F	N	N	F	S	F	S	S	F−	F	F	S	S	S	S
"B" Monel	S	S	S	S	S	F	N	N	F	N	F	F	N	S	N	F	N	N	F	S	F	S	S	F−	N	F	S	S	F	S
"H" Monel	S	S	S	S	S	S	F	F	F	F	F	F	N	S	N	F	N	N	F	S	F	S	S	F−	N	F	S	S	S	S
Duranickel	S	S	S	S	S	S	F	N	F	F	S	S	N	S	N	F	N	N	F	S	F	S	S	F−	F	F	S	S	S	S
"G" Nickel[2]	S	S	S	S	S	S	S	F	F	S	S	F	F	S	F	S	F	F	S	S	S	S	S	S	S	S	S	S	S	S
"S" Nickel[2]	S	S	S	S	S	S	F	F	F	S	F	S	F	S	F	S	F	F	S	S	S	S	S	S	S	S	S	S	S	S
Inconel	S	S	S	S	S	F+	N	N	N	N	F	F	N	F	N	F	N	N	F	S	S	F	S	F−	N	F	S	S	S	S
"S" Inconel[3]	S	S	S	S	S	S	S	S	S	S	S	S	F	S	F	S	F	F	S	S	S	S	S	S	S	S	S	S	S	S
400 Series Stainless Steel (Soft)	S	S	S	S	S	F	F	N	N	N	F	F	N	F	N	F	F	N	F	S	S	F	S	F−	N	F	S	F	F	S
400 Series Stainless Steel (Hard)	S	S	S	S	S	S	F	F	F	F	S	S	F	S	F	S	F	S	S	S	S	S	S	F+	F	S	S	S	S	S
300 Series Stainless Steel	S	S	S	S	S	F	N	N	N	N	F	F	N	F	F	F	N	N	F	S	S	F	S	F−	N	F	S	S	S	S
SAE 1000 to 6000 Steel (Soft)	S	S	S	S	S	F	N	N	N	N	F	F	N	F	N	S	N	N	S	S	S	S	S	F+	N	F	S	S	S	S
SAE 1000 to 6000 Steel (Hard)	S	S	S	S	S	S	F	F	F	F	S	S	F	S	F	S	F	S	S	S	S	S	S	S	F	S	S	S	S	S
Bronze (Leaded)[5]	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Ni-Vee Bronze "A"[4]	S	S	S	S	S	F	F	F	F	F	S	S	F	S	F	S	F	S	S	S	F	F	S	S	F	S	S	F	S	S
Ni-Vee Bronze "B"	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	F	S	S	F	S	S	S	S	S	S
Ni-Vee Bronze "D"	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Ni-Al Bronze[6]	S	S	S	S	S	F	F−	F−	F−	F−	S	S	F−	S	F−	F+	F−	F+	S	S	F	F+	S	F	F−	F+	S	F	S	S
Hastelloy "A"—"B"	S	S	S	S	S	F+	F	N	N	F	S	S	N	S	N	F	N	N	F	S	F	S	S	F−	N	F	S	S	S	S
Hastelloy "C"	S	S	S	S	S	S	F	F	F	F	S	S	F	S	F	S	F	F	S	S	S	S	S	F+	F	F	S	S	S	S
Hastelloy "D"	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Nitrided Steel	S	S	S	S	S	S	S	S	S	S	S	S	S	S	F	S	S	S	S	S	F	S	S	F	S	S	S	S	S	S
Chrome Plate[7]	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	?[7]	S
Stellite	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S

Degree of Resistance: **S** — *Satisfactory;* **F** — *Fair;* **N** — *Little or None*

Notes 1 to 7 — See pages . . .

19% PRODUCTION INCREASE AND SUPERIOR FINISH

when Universal Engineering Co. switched to

LEADED 6150

In the production of this collet, Universal Engineering Co. reported it was able to increase spindle speed from 308 to 374 R.P.M. and machine speed from 108 to 125 S.F.M. Feed was stepped up from .0027 to .0047 inch per revolution. In addition to a production increase from 101 to 120 pieces per hour, finish was greatly improved and tool life was extended appreciably.

These are typical benefits obtained by users of lead treated Aristoloy Steels—benefits which you can enjoy by getting in touch with your nearest Copperweld district office.

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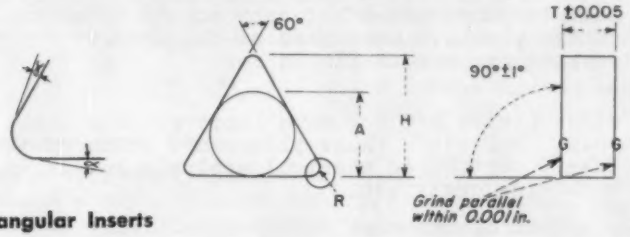
ARISTOLOY STEELS

Throw-Away Carbide Inserts..I

Proposed American Standard to be published, on approval, by ASME

Negative-Rake Carbide Blanks



Triangular Inserts

No.	A	T	H	R	α ° Max from Tangency
Utility Grade					
TBT8U2	0.250	0.125	0.344 ± 0.007	1/32	20
TBT12U3	0.375	0.188	0.516 ± 0.007	3/64	15
TBT16U4	0.500	0.188	0.688 ± 0.007	1/16	15
TBT20U6	0.625	0.250	0.844 ± 0.008	3/32	15
TBT24U8	0.750	0.313	1.000 ± 0.010	⅛	10
TBT28U10	0.875	0.375	1.156 ± 0.012	5/32	10
TBT32U10	1.000	0.375	1.344 ± 0.014	5/32	10
Precision Grade					
TBT8P2	0.250	0.125	0.344	1/32	20
TBT12P2	0.375	0.188	0.531	1/32	20
TBT12P4	0.375	0.188	0.500	1/16	15
TBT16P4	0.500	0.188	0.688	1/16	15
TBT16P8	0.500	0.188	0.625	⅛	10
TBT20P6	0.625	0.250	0.844	3/32	15

Square Inserts

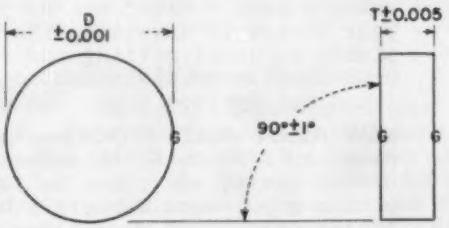
No.	A	T	H	R	α ° Max from Tangency
Utility Grade					
SQT-12U2	0.375 ± 0.005	0.125	0.429	1/32	15
SQT-16U3	0.500 ± 0.005	0.188	0.570	3/64	10
SQT-24U4	0.750 ± 0.007	0.188	0.857	1/16	10
Precision Grade					
SQT-12P2	0.375 ± 0.001	0.125	0.429	1/32	15
SQT-16P2	0.500 ± 0.001	0.188	0.575	1/32	15
SQT-16P4	0.500 ± 0.001	0.188	0.564	1/16	10
SQT-24P4	0.750 ± 0.001	0.188	0.857	1/16	10
SQT-24P8	0.750 ± 0.001	0.188	0.836	⅛	5

* Grind edges as well as sides
Tolerances on corner angle—utility, ± 15'; precision, ± 5'

Tolerances on Triangular Inserts

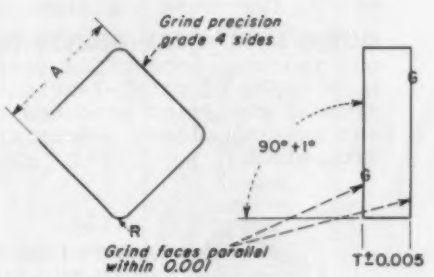
Dimension	Utility	Precision*
60° Angle	± 15'	± 5'
A	± 0.005	± 0.001
H	—	± 0.001

* Grind edges as well as sides



Round Inserts

No.	D	T
SCT-12P	0.375	0.125
SCT-16P	0.500	0.188



What's New in Steel...

ALUMINUM, PLASTICS AND MACHINERY FROM RYERSON

Information on stocks and services and other recent developments of interest to men concerned with cost-cutting opportunities, sources of supply and availability of steel, aluminum, plastics and metal-working machinery.

STRUCTURALS—Greatly improved structural stocks after many months of short supply is the biggest news at Ryerson plants. Even many of the heavier sections for which demand is strongest are now available for immediate shipment.

PLATES—Stocks of heavy carbon steel plates are now much improved—and light plates continue in excellent supply. Moreover, these plates are produced to a new specification with more closely controlled chemical analysis resulting in better forming, welding and machining qualities.

HOT ROLLED CARBON STEEL BARS, including bar-size (light-structural) shapes—Huge Ryerson stocks of practically every size and shape now ensure immediate shipment of your company's requirements. Angles, channels and tees in bar sizes (below 3") are in equally good supply.

PRE-PAINTED SHEETS AND STRIP—To save you costly finishing operations Ryerson can now furnish steel sheets or slit coils pre-finished with durable baked enamel. Steel can be finished one side or two, in any plain color or in your choice of several patterns—and users report that the painted finish stands up under cutting and forming operations without cracking or peeling. Unusually large sheet and coil stocks plus unequalled processing facilities round out Ryerson sheet and strip service.

NEW ALLOY PLATE STOCKS—Due in July, midwestern stocks of A8620 plate steel in 1/2" to 6" thicknesses. This case hardening steel, ideal for rings, discs, gears, etc., can be furnished in flats or flame-cut blanks. These stocks supplement eastern stocks of E8615 plates. Also coming this summer: Eastern stocks of 4140 alloy plate.

STAINLESS, CARBON STEEL TUBING AND COLD FINISHED BARS—All types and sizes available in the nation's largest stocks—including nickel-bearing stainless, supply of which was, until recently, affected by nickel shortage.

ALUMINUM FOR ARCHITECTURAL USE NEWLY AVAILABLE—Ryerson plants supplying aluminum can now furnish Type 5005 in sheets and coils. This type is especially suitable for architectural use because it closely matches the finish of architectural aluminum extrusions—and it takes clear or color anodizing very satisfactorily.

PVC PLASTIC PIPE IN LARGE DIAMETERS—8'' and 10'' pipe in both schedule 40 and 80 have been added to growing Ryerson stocks of the remarkably anti-corrosive plastic—Ryertex-Omicron polyvinyl chloride. Valves and fittings of PVC for these big sizes also available.

QUICK MACHINERY DELIVERIES FROM STOCK—Machinery demand continues strong but improved production facilities have resulted in quicker deliveries of many types of metal-fabricating machinery available from Ryerson. This is true of equipment produced by Kling, Dreis & Krump, Bertsch, Wysong & Miles and several others. Some of the more popular models are even available from stock.

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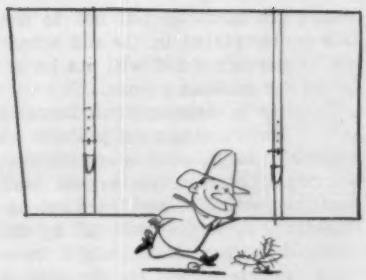


Briefcase—Texas Style

DOWN IN FORT WORTH, Convair has developed a metal container that works like a giant briefcase to ship skins for the B-58 from U S Chemical Milling Co at Los Angeles. Etched skins are packed with sheet neoprene to prevent slippage inside the container. The "briefcase" itself is made of two lid halves with metal frames, hinged together, and lined with Masonite. The containers replace wooden crates and have proved to be cheaper on a returnable basis. They also assure delivery of skins with a surface free from dents, scratches, or creases.

Optical Tooling

WE HAVE COME a long way from the basic optical tooling (with a surveyor's transit) introduced from England into aircraft plants late in World War II. At Boeing, for example, research engineers have designed and built 66 accessories for basic optical tooling instruments in the past four years. With the latest "plane-of-sight" planizer, any plane can be erected on a jig base regardless of angularity. To solve the problem of temperature changes in large jigs, Boeing uses measuring rods made of the same material as the jig. The rods are used in conjunction with optical tooling by Boeing and by all subcontractors to locate critical structure points. Thus the problem of temperature differential from plant-to-plant and day-to-day is eliminated.

Shortage Over?

THERE ARE REPORTS that the engineering shortage is not as serious as it was. Before you relax though, take a look at this statistic: About 500 engineers graduated from the University of Michigan early this summer. To woo these men, 550 companies sent representatives to the campus at least once during the past year. The average starting salary was $469.

Cast Turbine Wheels

MAJOR PROBLEM in building gas turbines for buses, trucks, and autos is how to find materials and production methods that are inexpensive enough to suit the competitive requirements of the auto industry. Ford's Scientific Laboratory is now experimenting with investment casting. The radial-flow impeller-expeller turns at 35,000 rpm and operates at 1600 F. It is being cast in Haynes No. 31. Investment casting eliminates all machining on blade surfaces. The axial-flow power wheel turns at 23,000 rpm and operates at 1300 F. It is being cast of Multimet. The cast wheels are vapor blasted and inspected.

Mobile Machines

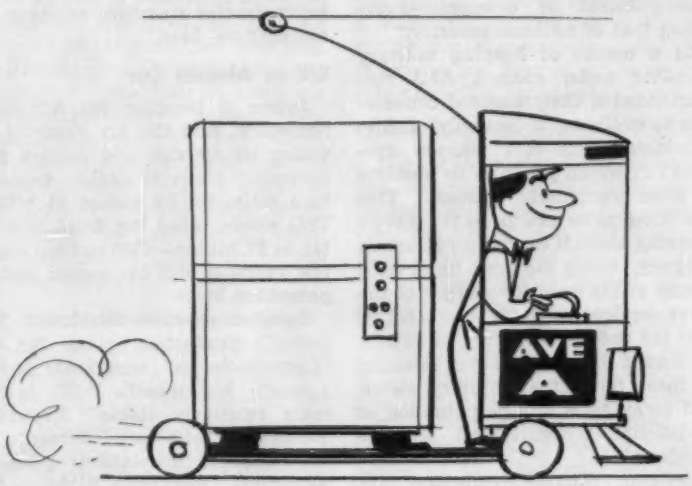
PUTTING MACHINES on roller skates (figuratively) so they can be rearranged to suit changes in production lines is not new. But a variation is to ship the machines to the toolroom for setup. Doehler-Jarvis does this in their plant in Pottstown, Pa. Die-casting machines are mounted on trolley tracks and following a run are moved to a service area (being immediately replaced on the line by a serviced machine) where the dies are changed and the machine is made ready for its next production run. The tracks under each machine lead to a plant door, outside of which runs a rail car onto which the machine is moved, then carried to the service area. The rail car holds two die-casting machines so that it can carry a machine "at the ready" to move into a production slot right after a machine is removed.

Classified Warning

IN THE BRITISH magazine *Metalworking Production* we encountered a classified ad that began: "Having tired at last of presenting such a large proportion of my income to the Revenue, I recently vacated my position as Machine Tool Sales Manager, and have taken to the road. . ." Our own Director of Internal Revenue should take warning—people can be pushed too far.

Manufacturing Research

THE IDEA of doing research in manufacturing methods may have gained its first adherents in the aircraft industry, but the auto builders have enthusiastically adopted it. According to Robert Critchfield, GM vice president in charge of Process Development Staff, General Motors had about 800 people classified as engineers in manufacturing—today they have nearly 5700. In 1940 there were 172 process engineers; today there are more than 1500.



Air Force Association Hears Pentagon

WASHINGTON—New warnings to industry of upcoming cutbacks and postponements in weapon production and development projects were aired at the Air Force Association's July 30-Aug 4 annual convention in Washington.

For the past two months at least, talk—and actual decisions—along these lines have been flowing from the Pentagon. But the AFA convention—held, ironically enough, to celebrate the Air Force's 50th anniversary and to publicize airpower achievements—provided top Air Force officials with the loudest sounding board to date for spelling out officially and in more detail what's ahead for aircraft, missile, and other military metalworking producers under the administration's current economy drive.

More Cuts on Way

In special Procurement and Logistics and Research & Development briefings, the industry representatives were told of the administration's intent to cut defense costs as a means of controlling what Dudley C Sharp, Assistant Air Force Secretary for Materiel, called "inflation and the unbearable tax burden."

The Association, however, criticized administration defense plans and called for increased appropriations for the Air Force. In a special policy statement, AFA said: "The immediate requirement is adoption of a military plan shorn of all wishful thinking, and with no consideration—political or economic—overriding that of national security."

As a means of keeping military spending under control, AFA recommended a Congressional commission to evaluate "objectively" and to eliminate "high-cost weapon systems . . . which prove to be obsolete or even marginally efficient." This was taken to be a swipe at the Navy's booming aircraft carrier construction program. Along the same lines, AFA hinted at the need for merger of the three services, said: "It is imperative that the defense structure be oriented toward the assignment of missions to meet the actual military threat and away from any perpetuation of traditional concepts and obsolete weapons."

Senator Stuart Symington (D, Mo), a longtime critic of administration defense policy, told AFA:

- The latest defense cutbacks make a shambles of U S disarmament negotiations with the Russians. Why, he asked, "should the Russians agree to a bilateral disarmament agreement when the U S is making its own unilateral cuts?"
- Continuing changes in aircraft and missile production schedules are wasting defense money. He cited "17 major changes last year in the Air Force because of budget decision," claimed the decisions in effect boosted production costs.

Senator Leverett Saltonstall (R, Mass), ranking minority member of the Senate Armed Services Committee, defended the administration's defense policy. He said, "We shouldn't weaken our defense by overspending."

Assistant Secretary Sharp predicted "an era of increasing competition between weapon systems for survival and competition between major contractors, vendors, and subcontractors for the privilege of manufacturing" the systems that do survive.

But he said that unit production costs and overhead expenses must not increase just because total production rates for planes and missiles fall below original schedules. He stressed that the Air Force will "resist the tendency" of major prime contractors to pull back military production from subcontractors to their own plants. Said Sharp: "A sound subcontractor structure enlarges the competitive base."

Billion Aircraft Cut

James H Douglas, the Air Force Secretary, said the Air Force is revising its aircraft and related procurement plans to reduce expenditure estimates by almost $1 billion. This would bring the fiscal 1958 total to $7 billion—$500 million under last year—or still the second highest peacetime level.

Douglas revealed the latest "adjusted" production plans for the "Century-Series" supersonic fighter aircraft: McDonnell's F-101 to "remain relatively stable"; Republic's F-105 to be "at a very low rate" until an improved all-weather model is available; Lockheed's F-104 to "increase considerably but not to the rate contemplated in the old schedule." Convair's F-106 will not be affected for at least a year.

Turning to development, Douglas said: "We are screening projects on a priority basis, as it is certain that a number of the less urgent ones must be postponed and there are undoubtedly some that will fall by the wayside sooner than might have been the case except for the present need to find savings. . . ."

Two fields were cited as "receiving careful attention" in the economy drive—aircraft modification requirements and authorization for new production facilities.

"Balance of Pressures"

Douglas said a "balance of pressures"—from the Air Force to maintain expenditures on at least a stable level, and from "the public concern over Federal spending"—would determine the future level of total military expenditures.

He expects spending to be maintained at not less than $38 billion annually—at least $200 million under the fiscal 1957 rate. But to hit this level in fiscal 1959, he said, "It might be necessary for Congress to appropriate $2 billion more than was appropriated this year." (Congress cut the Administration's fiscal 1958 appropriation request by roughly this amount).

Against this background of high defense expenditures, Lieut General Clarence Irvine, the Air Force's Deputy Chief of Staff for Materiel, said: "First-class design and production engineering should continue to prosper and grow and pay dividends."

Irvine called automation an "absolute need" in aircraft and missile production to keep defense costs under control. He said the objective should be to "maintain the most stable engineering and production level," but that to do this the Air Force "would have to be selective, would have to pick the best horses as we go along."

General E W Rawlings, Air Materiel commander, said that "no matter how many of you may feel that we do, we don't want to run our contractors' businesses." He warned, however, that "this is going to be a tricky period," hinting of stronger

on Cutbacks

Air Force direction over contractor operations.

Richard E Horner, Assistant Air Force Secretary for Research & Development, forecast a "retrenchment" in his program. He said that "one of the most difficult problems that the Air Force (and aircraft companies) face is the initiation and conduct of research and development in an environment which inevitably associates high risk effort with waste and is critical thereof.

"Faced with the necessity of insuring the compatibility of our fiscal policies and our defense needs, the satisfaction of our military requirements within the availability of our economic resources, while carefully avoiding damage to either our economic structure or our military capabilities, is the real challenge."

Chrysler Denies "Faulty Tank" Charges

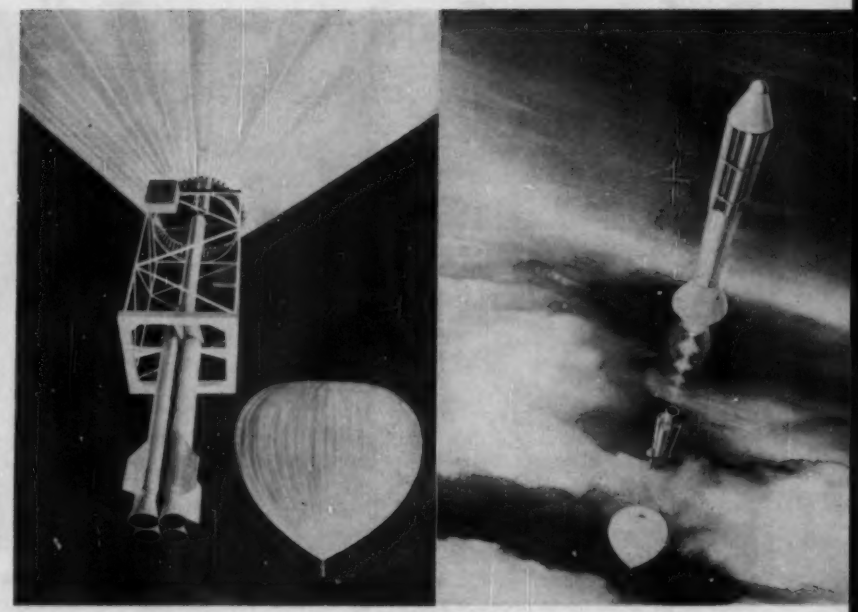
DETROIT—Chrysler Corp has hotly denied House Military Operations Subcommittee charges that although the government handed Chrysler a "blank check" to build heavy tanks for the Korean War, all it got in return were faulty tanks.

Says a Chrysler spokesman: "Heavy tanks (M-48 mediums, M-103 heavies) have fulfilled all specifications set forth . . . and have been accepted by the government.

"In the Holifield Committee hearings on March 22, 1957, this question was asked of a witness representing the Army, 'Does the Army feel that the contractor (Chrysler) has complied fully with the terms of the engineering and supply contract?' The answer: 'Yes.' "

Not only that, Chrysler says, the Army considered the T-42 (now the M-103) completely battleworthy, and the Marines are accepting it with certain refinements.

Congress's charge: "In one huge bundle, the Army handed Chrysler a contract for the M43 and T43 . . . relied on the company . . . and hoped for the best . . . The delivery dates were not met and the tanks were not acceptable for service . . . (although) the contractor was largely relieved of responsibility beyond 'best efforts.' "



At launch altitude . . . of 100,000 feet, the Far Side rocket vehicle's 3.75-million-cu-ft balloon is inflated to its maximum diameter of 200 ft. Vehicle is then launched vertically through the apex of the balloon. Inset: comparative size of balloon and vehicle

First-stage separation . . . of rocket vehicle and balloon is shown here. Thrust of first-stage rocket engines is complete, the vehicle has passed upward through the apex of the balloon, and now the second-stage rocket engine will ignite

Balloon-Launched Rocket to Seek New Heights in Search for Scientific Data

GLENDALE, CALIF — The next three months will see the launching of a rocket vehicle to a height thousands of miles above the surface of the earth—if all goes well, that is. It's all part of Operation Far Side, a program sponsored by the Air Force Office of Scientific Research, Air Research and Development Command. Ford Motor Co's Aeronutronic Systems Inc, Glendale, designed, fabricated, and will fire the rocket, which carries instruments to measure the environment at great distances from the earth. Future aerial weapons systems are expected to benefit from information picked up by the Far Side rocket.

First Lighter-than-Air Launching

The rocket vehicle will be the first to take off from a lighter-than-air rocket launching platform—in this case the largest balloon ever launched. Here's how it works:

The 200-ft-diameter balloon will hoist the 1900-lb rocket to 100,000 ft. Then the rocket, inserted into the lower end of the balloon, will blast upward through the balloon with an initial thrust of 160,000 lbs. After that, propellant rockets will boost the vehicle in three more stages to a maximum acceleration of 200 Gs, taking just 26 seconds from the time it leaves the balloon to become a free projectile headed into space.

Cosmic Ray Measurement

During the rocket vehicle's ascent and descent, a miniaturized radio transmitter in the 6 x 4 in. instrument package will transmit measurement of cosmic rays and other data to recording stations located on the ground.

Subcontractors on the Far Side project include Grand Central Rocket Co, Mentone, Calif; Thiokol Chemical Corp, Elkton, Md; General Mills Corp (which designed, produced and tested the balloon,) and Dr S Fred Singer of the University of Maryland's scientific staff.

Defense Contractors Talk Mobilization

No Time for Buildup After Nuclear Attack, NSIA Warns

WASHINGTON — The assumption that the U S will have time for a prolonged industrial mobilization buildup after a nuclear attack on this country is "unsound." That's what the National Security Industrial Association, an organization of leading military contractors, has just told the Pentagon.

"A Must for Small Wars"

But, the defense contractors say, mobilization planning is a must for "small peripheral wars which constitute a significant drain on the national resources."

NSIA's report—"Industry and Defense Are Inseparable"—insists that hard goods producers should continue to be lined up to produce specified military items for Korea-type conflicts.

This conclusion brings the association pretty much in line with the military policy shift that has shaped up over the past year or so. In the past, overall mobilization plans were based on the assumption that (as in World War II) there would be a prolonged industrial buildup, reaching peak wartime output in three years.

Extended Mobilization Is Out

Now, top Pentagon planners have generally accepted the theory—long argued by the Air Force—that there will be no chance for an extended mobilization following a nuclear attack, that a future general war must be fought with the forces already in being or with hastily stepped-up production from plants already in war production.

There are some Pentagon officials —notably in the Air Force—who put the damper even on the intricate limited-war type of planning covered in NSIA's report. These officials claim that in a future limited or local war, the U S won't commit its full forces. There would be only a limited step-up in production of selected equipment and this will be by plants already prepared for accelerated emergency production. Under this theory, a limited war which would require a larger commitment would have already become a general nuclear conflict.

The latest consequence of this switch in mobilization policy is the apprehension being felt by many machine tool builders over the impact on their industry of the growing volume of military tool disposals (see p93).

The Planes-to-Missiles Switch

In part, this stems from the transition to supersonic planes and missiles which has left behind a sizeable inventory of special-purpose machine tools designed to produce what are now obsolete end-items. But also responsible for the increasing amount of production equipment being declared surplus and coming up for sale is the latest mobilization thinking—and the resulting breakup of idle tool packages laid away for heavy-volume weapons output after the start of a future war.

NSIA Ideas Run Afoul of Budget

Many of NSIA's proposals run smack into the Pentagon's current drive to trim or at least hold defense expenditures at a stable level—a policy which is likely to control the military program as long as there are problems of high tax rates and statutory debt limits for many years to come. For instance, NSIA proposes that long-range mobilization considerations be a factor in procurement contract awards—along with price.

Some Premium Prices Still Okay

Right now, there's authority to pay premium prices on contracts just to put or keep strategic suppliers in production. But this authority is used sparingly if at all because of the cost.

NSIA's mobilization report was prepared by a 75-man committee headed by E B English of Caterpillar Tractor Co. It was in the making for over a year, was prepared at the request of the Assistant Secretary of Defense for Supply & Logistics.

The NSIA Recommendations

Chief recommendations in the report—many bearing on current procurement policy rather than on long-range mobilization planning— call for:

- Greater responsibility for prime military contractors over their own production. Says NSIA: military procurement officials make "insufficient differentiation between cost-reimbursement type contracts and fixed-price type contracts. In the first category, the government does exercise control and supervision since it is mainly responsible for the results obtained, but in the second category, while the primary 'mission' is the delivery of finished articles, government procurement practices and procedures do not allow the contractor to be sufficiently 'self-sustaining.'

Prototype Machine Tool Lines

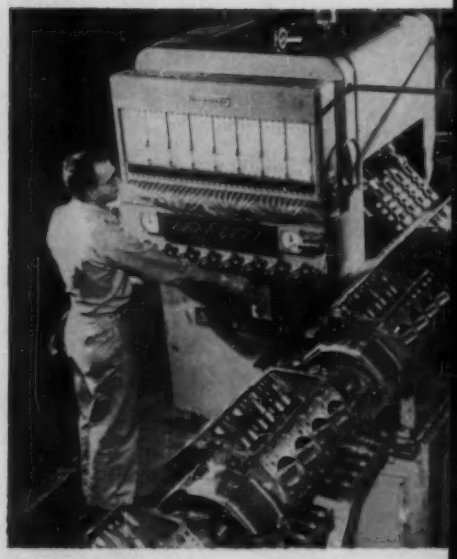
- Setting up "prototype production lines" for machine tools "required for wartime which are in limited production or not in production during peacetime."
- Government policy to defer technical students in school and apprentices from military service.
- The government to stress to small firms when "it is in their best interest" to act as "dependable subcontractors" in defense production. "The innumerable risks and responsibilities involved in government prime contracting are not thoroughly understood nor even known by many who feel their appropriate niche is that of the prime contractor."

More Register Usage

- Greater use of the "Register of Planned Producers" and the "Preferential Planning List"—rosters of suppliers of the top-priority weapons that serve as the backbone in mobilization planning—for selection of prime and subcontractors in current procurement.

Urges New Policy

- A "forthright statement" that it is "not the government's policy to obtain proprietary information' for any purpose whatsoever except through negotiation and agreement with the holder."
- Producers to be "advised when it appears that multiple sources will be required for their planned items, and that they be encouraged to consider establishing secondary plants or license second sources as the situation demands, but at the option of the planned producer."



From belt-driven manufacture of horseless carriages in 1908 to automated output of rocket engines . . .

Olds at 60 Points with Pride to Its New Look

Oldsmobile this month celebrates its 60th anniversary in plants capable of turning out more than 500,000 cars a year. Back in 1897, when Ransom E Olds and Frank Clark built the first Olds gas buggy at Lansing, Mich, they were undecided whether to power it with gas, steam or electricity—luckily picked the gas engine. Since then, Olds has pioneered in the curved dashboard, the folding top and windshield, chromium plating, Hydra-Matic drive. The Lansing plant alone today covers more than 5-million sq ft, although some 60% of Oldsmobile output is concentrated in seven Buick-Oldsmobile-Pontiac plants scattered across the nation

Excess Plane Profits? "Absurd," Says GM

DETROIT — Charges that General Motors Corp overstated production costs on a 1952-1955 Air Force contract for manufacture of F-84F jet fighter bombers have been hotly denied by General Motors officials.

The charges were made recently in a report by the government's General Accounting Office to the House Armed Services Investigations Subcommittee, which has been making headlines with its continuing probe of defense contract profits. Implicated, too, in the charges are those Air Force officers whose laxity permitted paying of "unreasonably high prices" because they failed to "analyze and evaluate" GM price proposals effectively.

"Overestimated" Costs?

Specifically, GAO has accused GM of "overestimating" costs of turning out 599 F-84Fs and spare parts at its Kansas City, Mo, Buick-Olds-Pontiac assembly plant. According to GAO, GM "overestimated" costs by $8.3 million for labor, manufacturing overhead and through failure to reflect reductions in subcontractor prices, which GM allegedly knew about in advance of the contract negotiations. GAO also accused GM of refusing the Agency's auditors access to its records on an Army Ordnance tank contract.

Air Force Was Satisfied

Replying to the charges, GM officials say the F-84F contract was completed "to the satisfaction of the Air Force," that GM profit on the entire contract was 11.3% on sales before taxes, and 5.4% after taxes—"a reasonable rate of profit . . . substantially below the rate of profit realized by GM on its commercial business."

Details of this contract have been a matter of public record for nearly two years, GM says, and, in fact, as early as September 1955 GM supplied detailed costs and profit data to this same House Armed Services Subcommittee, which at that time was investigating profits in the airframe industry. Again, on June 18 of this year, GM asked the U S Comptroller General, upon hearing that GAO would make such charges, that contract details be supplied to Congress.

Regarding the Cadillac contract, General Motors has reversed its earlier policy and has agreed to allow government auditors to examine its books on all government contracts, regardless of whether they have been completed. Cadillac had refused access to its books until the contract had been completed.

In a telegram to Subcommittee Chairman F Edward Hebert (D, La), who had threatened to subpoena GM if its tank records weren't made available to investigators, GM President Harlow Curtice said that the ban was Cadillac's and that he had not previously known of it.

Mr Curtice promptly okayed examination of the books by General Accounting Office Investigators.

FOREIGN REPORT

This is what was left of Fritz Werner AG after World War II...

West Berlin: Metalworking Phoenix

WEST BERLIN (McGraw-Hill World News)—Berlin may be a half-devastated island under two hostile flags, but it is still a place where the overwhelming majority of the inhabitants stay by choice rather than for lack of somewhere else to go. The same thing is true of the 765 metalworking firms of West Berlin and their 77,336 employees.

Why? Simply because being in Berlin today is good business. Take for instance, the machinery builders: after boosting sales almost 275% between 1950 and 1953, machinery builders increased that figure by another 75% in 1956 to a round sum of $117 million, with 27% of that taken up by exports.

Most of Output to West Germany

West Berlin metalworking as a whole last year turned out 23.2% of the gross industrial product of the Allied sector of the city.

WEMA, the metalworking industry's trade association, says that 58% of total metalworking production was sold in the Federal Republic, 26.2% more went to West Berlin itself, and 15.8% was exported.

Raw materials, rolling mill products and so forth in the main come from West Germany. Most foundry products come from West Berlin itself, the balance from West Germany. Thus, for the moment at least, metalworking supplies are in good shape.

Berlin Marks Time

In the minds of most Berliners, (East and West), it is a foregone conclusion that at some future date Berlin will once more be the capital city of a reunified Germany. Were this not the case, the whole situation in West Berlin undoubtedly would be different than it is today. Instead of its new apartment buildings, shops, factories and 2.2-million inhabitants, it might be even more of a ghost town than rubbled East Berlin, where 1945 seems only yesterday.

Of course, there have been changes. Siemens, reputedly the largest electrical firm in the world during the 1930's, has shifted its headquarters to Erlangen in West Germany. Thus it now employs 40,000 at its Berlin works compared to 60,000 before the war. But the Berlin plant produces 40% of all Siemens-made equipment—from waterwheel generators, synchronous and non-synchronous motors, industrial and high-tension switchgear, refrigerators, washing machines, radio and tv sets to power cables and communication links. There's little question of the importance which Siemens attaches to its Berlin operation.

AEG, the other giant German electrical firm, splits its headquarters between Berlin and Frankfurt/Main in West Germany, with a third-of-all production coming from its five Berlin plants. Five percent of what's produced in these plants is sold in West Berlin itself; 77% goes to West Germany; the remaining 18% into export.

Practically all of AEG's raw material is brought in from West Germany although some of it is ordered from or bought through West Berlin firms.

Firms with plants in West Berlin are able to sell competitively because of the so-called "Berlin Help" extended by the Federal Republic, which provides exemption from a 4% sales tax for goods finished in West Berlin. In addition, for a man (with one child) earning $142.86 monthly, a West German employer pays 20% more in contribution tax than a West Berlin employer. In combination, it just about makes up for the extra costs of transportation and handling.

The uncertainty regarding Berlin which accompanied and followed the Soviet blockade of 1948-49 has largely vanished. West Berlin's ability to

Today, Werner is Berlin's biggest, busiest machine tool maker

from the Ashes of World War II

obtain adequate supplies of materials and to deliver products on time has dissipated an earlier lack of confidence in them which once plagued the city's merchants.

This is not to suggest it's as easy to send a jigborer from West Berlin to Wiesbaden as it is from New Jersey to West Virginia. From Berlin, rail transport means using East German rolling stock through the Soviet Zone of Germany, while highway transport entails reams of documents, and the idiosyncrasies of the East German check points are formidable. With special precision equipment, some firms will use air freight despite the expense. Nevertheless, customers expect and receive delivery as a matter of course, much as they would from any other supplier.

US Aids Recovery

According to an executive at Fritz Werner AG, one of Germany's leading manufacturers of machine tools and special machines, much of the credit for restoring business to normal belongs to the Americans.

"The determination of the U S to stay in Berlin restored world confidence in Berlin. An attack on us means an attack on the United States. Besides that, a new blockade would bring a counter-blockade of East Germany, and that would hurt the Communists more than us, since the Russians would have to make up for goods now supplied by the West to East Germany. So you can see we're not too worried."

Few Exports to East Germany

Five-million dollars in exports to East Germany by West Berlin's metalworking industry in 1956 accounted for less than 1% of total exports. Specialists like Fritz Werner AG and Herbert Lindner GmbH are almost completely cut off by the embargo list. Siemens and AEG find part of their goods similarly blocked and consumer items unmarketable because of the nature of the Communist governments in Eastern Europe, as well as in East Germany.

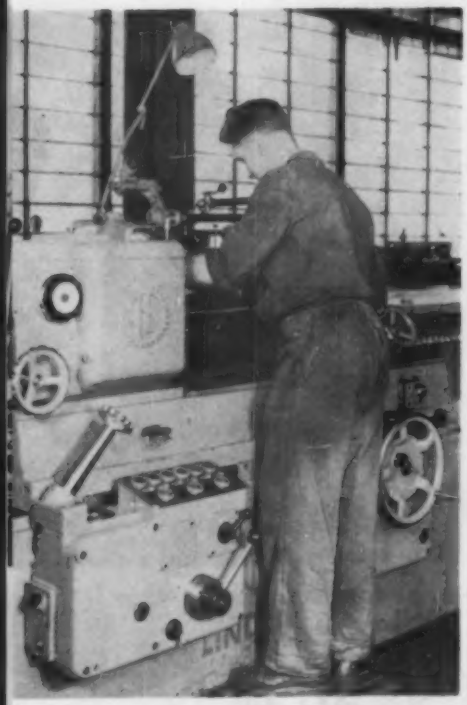
Pintsch-Bamag AG, on the other hand, now sends about 10% of its total Berlin production to the East Bloc and expects with an improvement in the political situation it could up that by 100 to 150%. At present, 60% of Pintsch-Bamag's total Berlin production of heavy machinery, chemical, electrical plant, streetlighting and electronic equipment is exported. Another 30% goes to West Germany, and the final 10% is sold in West Berlin itself.

The case of Dr Lutz Malkomes, director of the Berlin Works of Pintsch-Bamag, may not completely define the general situation of Berlin industry, but it's interesting nonetheless. Following the merger of Pintsch and Bamag in 1953, (Julius Pintsch AG had been in Berlin since 1843), the company moved its headquarters to Butzbach in West Germany. Malkomes, who comes from the old province of Hesse and had worked and lived in the Rhineland and Ruhr, was offered a choice of being works director either in Cologne (in the Rhineland-Ruhr area) or in Berlin. The jobs carried the same responsibility and the same pay.

"For three days," says Malkomes, "I thought it over. Then I decided on Berlin. I've never regretted it."

The chance to be in on the ground floor when West Berlin once more becomes a full-fledged world crossroads is clearly the decisive factor in Malkomes' thinking. Whatever physical danger might be involved in a potential forward position in war, and whatever boredom might result from not being able to go beyond the city limits on a summer weekend is balanced out by prospects for the future.

As matters stand today, a West Berlin metalworking firm can ob-



Rebirth since 1950 . . .

West Berlin's Herbert Lindner GmbH today turns out large and small (like this one) jig borers, thread grinders, precision indexing tables and many other machine tool products. When WWII ended, the Russians moved in, completely dismantled the plant, leaving what was left of it to stand idle until 1950, when its founder's widow, Erna Lindner started it up with Marshall Plan aid. Before the war, Lindner split its exports about equally between East and West. Now, with exports to the Communist bloc completely embargoed, Lindner still exports 70% of its total output, with 15-17% going to the U S

tain labor a shade more easily and more cheaply than in West Germany. The average wage in West Berlin for an employee with at least 26 weeks of service is 47¢ an hour, a bit under the average for West Germany. However, bonus payments up to 15% sometimes put the West Berliner above his Federal Republic counterpart.

According to the West Berlin industry association, WEMA, unemployment, which had been shrinking since 1950, has increased slightly since the beginning of 1957 because of a slowed economic pace throughout West Germany and West Berlin. The Association adds that skilled laborers are hard to get.

Pintsch-Bamag claims that it has a labor force turnover of 20 to 33 1/3% annually, as refugees come in from the East, work for four or five months to get a stake in the Federal Republic, then move on. Malkomes says it's a typical situation in the industry.

Small Worker Turnover

On the other hand, Fritz Werner AG says the bulk of its 2200-man work force has been with the company for 20-30 years and that 80% are craftsmen. Herbert Lindner GmbH estimates its turnover at less than 4% annually. Completely dismantled by the Russians and idle until 1950 when Marshall Plan aid allowed the firm to re-build, Lindner claims about 25% of its pre-war workers have returned. Now the problem is finding the 1 apprentice in 10 sufficiently skilled to perform Lindner's highly specialized work.

Today, West Berlin's metalworking industry is rolling along at a respectable clip. When Germany's reunification comes, the tough, patient Berliners, who have withstood the Soviet bullying and blockading, figure being in on the ground floor will make up for the inconvenience.

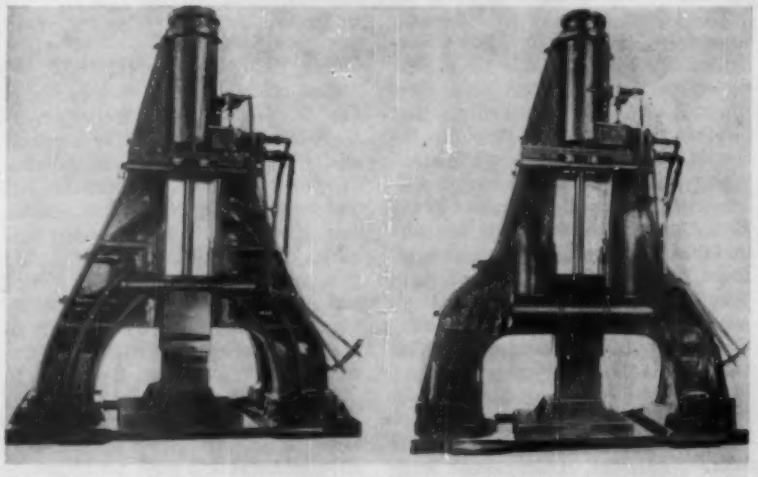
AUSTRALIA'S GM-HOLDEN PLANS HUGE EXPANSION

MELBOURNE, AUSTRALIA—(McGraw-Hill World News)—Several million dollars will shortly be spent by General Motors Corp's Australian automaking subsidiary, GM-Holden, to expand production, and to place Australia in a more favorable competitive position in the Asian and Eastern auto markets.

Holden today is producing 100,000 units a year, or 416 per working day —but this production figure is still a long way from meeting domestic demand alone. Several other nations are interested in Holden autos and station wagons, too. GM-Holden is currently appointing distributors in several new overseas markets.

Chrysler, too, is putting on a production drive. Chrysler Corp's Adelaide, South Australia, plant has reengaged 400 employees because of increased demand for the new Chrysler Royal. And Sydney British Motors Corp is putting finishing touches to plans for a completely manufactured-in-Australia passenger car.

Headed for Latin America



These two double-frame, steam-forging hammers, built by Chambersburg Engineering Co, Chambersburg, Pa, will be South America's "mas grandes" (literal translation: most biggest) when they arrive at Fabrica Nacional de Carburo y Metalurgia S/A, Santiago, Chile. The 16,000-lb and 10,000-lb hammers will work as a team, making steel railroad tire rings and axles. The 16,000-pounder will pancake and pierce billets weighing up to 1100 lb—forming a doughnut, which then goes to the 10,000-pounder, where it is placed in a special die set, and expanded and forged to proper thickness. After reheating, the forging goes to a finishing mill, where the steel tire is expanded to its final diameter and the rim is shaped. The 10,000-lb hammer will also be used for forging railroad axles, employing dies with half-round impressions machined into each die face

Midwest...

Bendix Aviation Corp and **US Atomic Energy Commission** have signed a five-year contract for continued operation of the company's Kansas City, Mo, division. Bendix has operated the facility for the Commission for the past eight years; it's devoted exclusively to the atomic energy program, producing a variety of products, manufacturing and assembling complex electronic, electro-mechanical and mechanical devices used in the AEC program. Plant operations include manufacturing procedures in heavy and light precision machining, sheet metal fabrication, plating, heat-treating, radiography and X-ray, precision electronic assembly, testing, and inspection. Facility occupies 1 million sq ft, represents a $60-million government investment. Employment recently passed the 5000 mark, is increasing. . . . **Illinois Gear & Machine Co,** Chicago, is putting $2 million into expansion of its South Works, doubling size of its heavy manufacturing division. More than half of the output is going into heavy machine tools . . . **Aluminum Co of America** will spend $54 million to double peacetime capacity of its big mill at Davenport, Iowa. Giant sheet, plate, and foil rolling facilities bring Alcoa's total investment in the plant to $200 million . . . **McDonnell Aircraft Co,** St. Louis, Mo, has a $4.5 million contract for research and development of a new AF missile, the Quail . . . **Fastcut Tool Co,** Detroit, has been purchased (all outstanding stock) by a former partner, Earl R Putnam. New controller of the company plans addition of new items to company's line of cutting tools . . . Complete line of segmental cold cutting saws, made in Sheffield, England, by **Firth Brown Tools, Ltd,** will be sold and serviced in the US by **Ernest F Donley's Sons, Inc,** Cleveland, Ohio.

East...

Air Force has announced production rate cut for **Republic Aviation's** F-105 fighter-bomber. Service will not cut down on number it will buy, wants more improved model planes . . . **Air Reduction Sales Co** has started construction of new air separation plant in Acton, Mass. Plant and related facilities will run over $9 million . . . **Norton Co's** expansion program calls for the installation of steam generating equipment which will increase main power plant capacity by 75% . . . Recent military contracts awarded to **Lewyt Mfg Corp,** Long Island City, have given company backlog totalling $22 million . . . **Pi-Square Engineering Co,** Boston, will operate new **American Center for Analog Computing.** Center will supply consulting and engineering services to users of analog techniques . . . New York Univ has planned a one-week course in Titanium Metallurgy, Sept 9 thru 13... **Fairchild Aircraft,** Hagerstown, Md, has received orders for 18 more C-123 "Boxcars," bringing total built or ordered to nearly 300 . . . **Avco Mfg Corp** has received $15.7 million in new contracts for work in electronics and aircraft engine development . . . **Spring Garden Institute,** Philadelphia, has established a **Metal Removal Center** for basic research in metal removal techniques. Seminars in metal removal are also offered . . . **Minneapolis Honeywell's Brown Instrument Div,** Philadelphia, has received $400,000 order for automatic control instruments and valves for a Brazilian oil refinery . . . **Firth-Sterling, Inc,** Pittsburgh, has announced a 4% increase in base prices of high-temperature alloys . . . Merger discussions are under way between **General Dynamics Corp** and **Liquid Carbonic Corp. Liquid Carbonic** would become division of **General Dynamics;** stock exchange would be on share-for-share basis . . . **Schutte & Koerting Co,** Cornwells Heights, Penna, manufacturer of jet apparatus, valves, and instruments, will spend $500,000 in adding 25,000 sq ft to present plant. Addition will house boring, milling, and drilling equipment, lathes, shears, and bending rolls . . . **Westinghouse Electric Corp** has been awarded contract to build generating and control systems for the AF's B-58 Hustler bomber . . . Expansion to the tune of $33 million at **Lukens Steel,** Coatesville, Penna, is intended to up ingot capacity by nearly 25%, from 750,000 to 925,000 tons annually . . . **Penco Metal Products,** a division of **Alan Wood Steel Co,** is producing steel storage equipment at its new $2.5-million plant 25 miles north of Philadelphia . . . **Seewald, Inc,** New Brunswick, NJ, announce their franchise in the US for all **VDF** equipment, German manufacturer of precision machine tools . . . **Resistance Welders Mfgrs Assoc** and the International Correspondence Schools have prepared a course in Resistance Welding Technology . . . **Allegheny Ludlum Steel Corp** has announced the opening of a new tool steel warehouse in Newark, NJ, to serve NY sales territory . . . **Calidyne Co** has broken ground for its new 12-acre manufacturing site at Woburn, Mass. Plant for manufacture of vibration of test equipment should be ready early next year . . . **Cold Metal Products Co** has been absorbed by **Jones & Laughlin Steel Corp,** Pittsburgh, and will become the **Strip Steel Div of J & L.**

West...

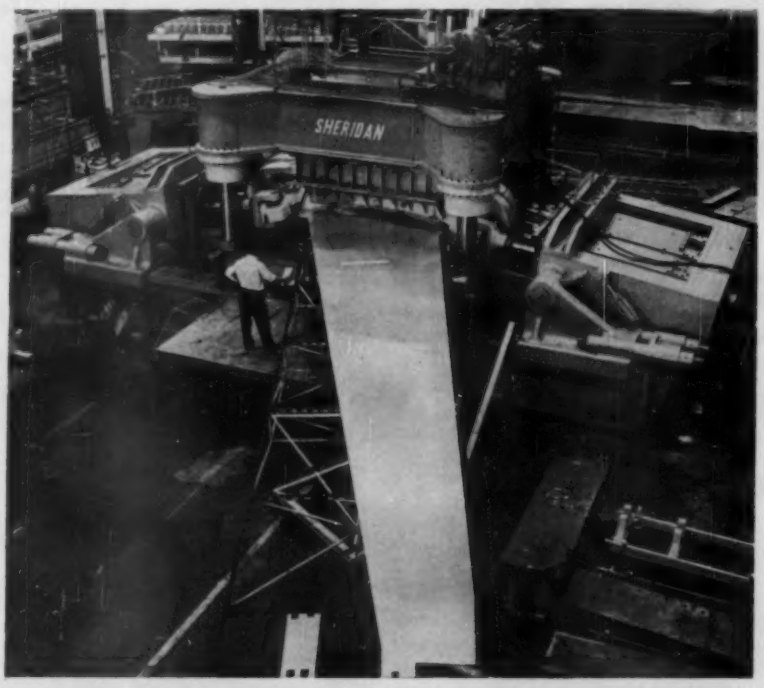
Computer Division of **Bendix Aviation** is doubling the size of its manufacturing facilities at Los Angeles because of growing demand for general purpose computers. Company has installed more than 50 units since first delivery two years ago; expansion will increase production by 100 machines annually . . . **Douglas Aircraft,** Santa Monica, will fill a $12-million order for two DC-8 jet airliners placed by **A A Onassis** interests for use on Olympic Airways international routes in 1960. **Douglas** also has a $38.9 million AF contract to turn out C-133 cargo planes at its Long Beach facilities. Order, an addition to an earlier program, involves a change in type of contract from cost-plus-fixed-fee to cost-plus-incentive, expected to produce savings for the Air Force in the long run . . . **Hufford Machinery Works,** El Segundo, will construct a large spin forge machine for **Marquardt Aircraft Co,** Van Nuys. The $500,000 unit, to be installed in **Marquardt's** Ogden, Utah, plant, will be used to make parts for the jet and missile programs . . . **Hunter-Douglas,** Riverside, Calif, division of **Bridgeport Brass Co,** has a $2-million Navy order for initial production of aluminum rocket motor tubes for its 5-in. air-to-ground Zuni rocket. Company is currently turning out metal parts for the Navy Sidewinder air-to-air guided missile . . . **Hardman Tool & Engineering Co,** Los Angeles, has a contract from **Boeing Airplane** for manufacture of passenger seating for the 707 jet airliners . . . **North American**

FIELD REPORT

Instruments, Inc, Los Angeles subsidiary of **Norris-Thermador Corp,** has changed its name to **Northam Electronics, Inc;** it makes electronic components for the aircraft and missile industries . . . Air Force has placed a $73-million order with **Northrop Aircraft,** Hawthorne, Calif, for initial production of the Snark SM-62, capable of delivering a hydrogen bomb within a 5000-mile distance. Contract calls for volume production and delivery to units of the Strategic Air Command at an undisclosed date . . . **American President Lines, Ltd,** has invited bids for two $20-million passenger-cargo vessels. Construction will be started by Nov 30, contracts will be awarded by Sept 30 . . . **Peninsula Steel Products & Equipment Co,** newly formed corporation, expects the first unit of its $175,000 plant at San Jose to be in operation this month. Company specializes in fabrication of light structural plate and sheet steel. . . . **Bethlehem Pacific Steel Corp's Shipbuilding Divison** has started a modernization program at its San Francisco yard, partly aimed at getting more non-marine fabrication . . . **Food Machinery & Chemical Corp,** San Jose, has $8 million worth of new contracts from San Francisco Ordnance District. Some $5.5 million is for additional M59 armored infantry personnel carriers; remainder for classified research and development . . . **Quality Tool & Die Co,** San Leandro, will complete construction of its new 6000-sq-ft building by Sept 1, will move soon after . . . **Longren Aircraft Co,** Torrance, Calif, has a $750,000 order from **Chance Vought** for Navy Fighter F8U-1 duct assemblies. Contract boosts **Longren's** backlog in defense and commercial jet fields to between $5 and $6 million . . . **Dayton & Bakewell,** a leading western distributor of machine tools, has moved to new, larger headquarters at 1950 Lovelace Ave, Los Angeles . . . **Sargent Engineering Corp,** designer and producer of components for marine, aviation, and missile industries, has expanded plant facilities in Huntington Park, Calif.

South . . .

Frigidaire Sales Corp is reportedly moving its Roanoke, Va, sales and service center to Charlotte, NC, as another step in its realignment of southeastern branches . . . Also in Charlotte: **Westinghouse Electric** has begun construction of its new 28,000-sq-ft maintenance and repair plant; completion is scheduled for next June . . . **Standard Container Inc,** Montclair, NJ, manufacturer of sprayers and metal containers, will start Georgia operations in a 30,000-sq-ft plant at Homerville . . . **Southern States Iron Roofing Co** is planning an 18,000-sq-ft expansion of its Atlanta manufacturing and warehouse facilities . . . **Mutual Steel Co,** Birmingham, will put up a $165,000 steel fabricating plant there . . . **Mid-South Industries, Inc,** Columbia, SC, producer of aluminum and plastic products, has completed construction of its new plant which replaces the White Rock facility. Company is successor to **Electronics, Inc** . . . **Tube Turns,** Louisville, Ky, celebrated its 30th anniversary last month. Firm, a division of **National Cylinder Gas Co** of Chicago, is the country's largest manufacturer of welding fittings and flanges for piping systems, and a major producer of forgings for aircraft engines . . . **Alabama Pipe Co, Anniston, Ala,** maker of cast iron pipe, is installing machinery in the plant it's purchased in Southgate, Calif . . . **Florida Electric Steel Mill Corp** has been set up to build an electric blast furnace on a 12-acre site near Tampa. The $2-million plant, Florida's first steel mill, will be completed in eight months.



Biggest 4-Way Stretch Press for Douglas Long Beach Plant

Said to be the world's largest, this 4-directional stretch press is now in operation at Douglas Aircraft, Long Beach, Calif, forming part of the airfoil for DC-8 jetliners from 10 x 50 ft aluminum plate. The huge, specially built Sheridan press takes 1200-lb skins, already tapered longitudinally from 0.230 to 0.135 in., rough-trimmed and with dihedral angle formed on a power brake. Four-way stretch is accomplished by centering the dihedral bend over a form die ram and engaging the stretch press jaws to the fore and aft sides of the skin. Ram rises under 450-ton pressure, stretching skin longitudinally as jaws exert a 150-ton cordwise pull. Holding fixture extends well beyond press to support outboard part of the 50-ft skin. Templet guides a second rough trimming that brings the part to within 4 in. of its final dimensions before aging. Formed airfoil is then cleaned, surface-treated, and painted before assembly

James Beré has been named president of Axelson Manufacturing Co, a division of US Industries, Inc. He was formerly general manager

Joseph C Drader, a vice president of Michigan Tool Co, and head of the company's research work in the gear development field, has retired after 40 years' service with the firm

Walter E Rollins (above), supervisor of screw machine sales projects, Brown & Sharpe Mfg Co, and **Oscar T Lippman,** will form a two-man engineering team operating in the field. They'll offer on-the-job study to improve efficiency of B&S automatic screw machine production in customers' plants

Names in the News . . .

Richard A Powley has been appointed president of the Pesco Products Division of Borg-Warner Corp in in Bedford, Ohio. Mr Powley was formerly assistant general manager of Ford Motor Co's Aircraft Engine Division, Chicago.

James F Connaughton has been elected executive vice president of Wheelabrator Corp, Mishawaka, Ind. He was associated for many years with Baldwin-Lima-Hamilton Corp as vice president and general manager of the Eddystone Division.

Robert L Strawbridge has been appointed vice president and general manager of Wales-Strippit Co, Akron, NY, unit of Houdaille Industries, Inc. He has been associated with the company for 12 years in sales and management positions. **Russell A Johnson** has been named sales manager. He was formerly general sales manager of the North Chicago Division.

Robert Clark has been named plant manager of Emhart Manufacturing Co's Hartford-Empire Co Division's Plant 3 and its Windsor Street Plant, Hartford, Conn. Mr Clark, formerly plant manager of Emhart's V & O Press Co Division, Hudson, NY, is succeeded there by **Neil Van Deusen,** general sales manager.

Howard A Johnston, president and chief executive officer of Marlin-Rockwell Corp, Jamestown, NY, bearings manufacturer, has been elected president of the Anti-Friction Bearing Manufacturers Association. **R S Wood,** general manager of the Ball and Roller Division of Link Belt Co, Indianapolis, has been elected vice president of the Association.

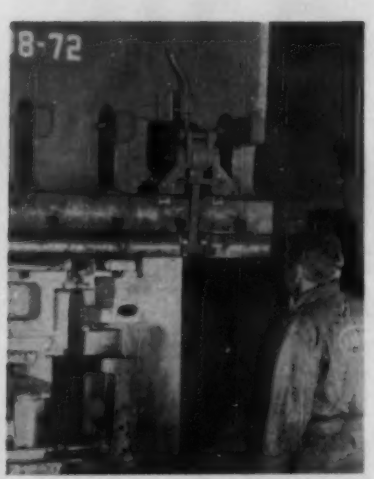
John H Diehl, assistant to the vice president in charge of Rockwell Manufacturing Co's Power Tool Division, has been named general manager of the recently expanded Bellefontaine, Ohio, plant.

Robert M Ward, former division manager for Thompson Products, Inc, has been made manager of the Berkeley Division of Beckman Instruments, Inc, Richmond, Calif. **Thomas Scatchard,** Berkeley plant manager, has been appointed director of manufacturing.

Louis R Ripley, formerly president of the Heli Coil Corp, has been elected president of the Waltham Precision Instrument Co, formerly Waltham Watch Co. He succeeds **Joseph Axler,** named president of Waltham Watch Co, now a separate corporation.

Harvey L Spaunburg, Jr, (left) has been appointed manufacturing manager of the Contract Sales Division of Hartford Special Machinery Co. **James J Jones,** manufacturing methods and sales estimation, succeeds Mr Spaunburg as sales manager of the Division

John H Groening, associated with Micromatic Hone Corp for the past seven years, has been promoted to chief engineer



Clamps which hold upper part of die to press slide are air operated and completely automatic. Electrical interlock prevents unclamping of dies when die is open

Danly "Quick Die Change" Principle Speeds Output of Large Stampings

In new Quick Die Change Presses the die can be located and attached to a bolster plate outside the press while a first die is being used in the press. In effect, the press is turning out stampings and tools are being set up for the next production run simultaneously. To accomplish this, each press is equipped with two bolster plates mounted on carriers. Each bolster plate and carrier make up a die carrier assembly.

The die carriers move into or out of the working area under the press slide at the touch of a button. They move on tracks at right angles to production flow, passing through the press uprights. Since it is not necessary to remove any mechanical handling equipment from between the presses when changing dies, downtime is greatly reduced. This die-changing system can be incorporated in the design of any type of press—single, double, or triple action both over- and underdrive presses.

To accommodate the use of air cushions, the carrier rings have a shoulder on the lower side for seating a pressure pin plate so that standard pressure pins can be installed in the die loading position. When pins are in position, tops will be below top surface of bolster. Before die carriers are moved, cushions are dropped down below top of bed.

Die carriers are individually motor driven. Carrier is moved into working position against positive stops. Retractable hydraulic cylinders lower the carrier so that bolster sits solidly on bed. Keys provide accurate bolster location. Adapter plates are furnished with each die carrier and are fastened to the upper half of the dies in the die loading position. After carrier is bolted down to bed, press slide at its stroke down position is adjusted down until it almost touches adapter plate. Die adapter is then clamped to press slide. Presses may be provided with manual, semi-automatic, or fully automatic die clamping.

After any die has been tried out and its shutheight is known, slide can be automatically adjusted by dialing the shutheight on the Automatic Slide Positioner.

A micro-inching drive provides full power stroking with accurate slide control at a speed of about one stroke per pin. Dies may be tried out in the press producing a stamping at a speed slow enough to allow operator to observe forming operation. Drive is instantly reversible and is completely independent of the flywheel.

Two lines of 108-in.-wide presses can be installed side-by-side in a standard 80-ft bay, leaving crane clearance to handle dies on bolster and still leaving an aisle between both lines when both bolsters are out in aisle space between presses. Installation of these presses would necessitate no changes in the foundations now existing in the major automotive stamping plants. The uprights are 30 in. wider than on standard presses.

Standard dies can be adapted to these presses. If adapter plates are provided with standard JIC pattern of T-slots, they can be bolted on die.

The 500-ton single-action press illustrated is but one unit of two complete lines now being built for SIMCA, European automobile manufacturer. It has a capacity, ½ in. above bottom of stroke, of 500 metric tons, and a slide stroke of 24 in. Measuring right-to-left and front-to-back, bed area is 108 x 72 in., slide area is 108 x 72 in., and the bed opening is 93 x 51 in. Upright opening is 76 in. wide x 67 in. high. Operating speed can be 12 or 18 spm.

Danly Machine Specialties, Inc, 2100 S Laramie Ave, Chicago 50, Ill

MATERIALS AND PARTS

Turret Punchpress With Pantograph Eliminates Setup and Work Layout

High-speed piercing of truck parts, heavy electronics chassis, panels, and other sheet metal or plate parts in low to medium production quantities can reportedly be done at 60 to 90% savings with the RA-61 turret punchpress. Machine has capacity of 40 tons and can be equipped with company's Speed Follower Gauge (pantograph) to eliminate setup and work layout. Flat sheet metal or plate up to 33 x 40 in. is pierced in one handling. Work is located to close tolerances and pierced at rate of 30 or more holes per min.

Rotating turret houses 20 to 28 tools which can be brought into piercing position in 3 to 5 sec. Work is secured to cross-slide of pantograph and follows the slide in any direction as operator moves control stylus from hole to hole in a color-coded templet clamped to the table. When stylus point enters a small-dia hole in templet, work is positioned and press automatically trips.

Heavy-duty press has throat depth of 33 in. and will punch holes up to 6-in dia in ⅛-in. mild steel or up to 1½-in. dia in ⅜-in. mild steel. Larger or rectangular openings can be made with a series of hits.

Wiedemann Machine Co, 4272 Wissahickon Ave, Philadelphia 32, Penna

Hydraulically Operated Turret-Drive Powers Self-Indexing Lathes

Hydraulically operated turret-drive, designated Hydrive, powers self-indexing lathes from bench size to No. 5 turret lathes. Unit automates the turret, feeds the cross-slide, advances bar stock, reverses direction of spindle rotation for tapping, and opens and closes the collet. Manufacturer claims production increases up to 100%. Unit reduces operator fatigue and makes it possible for one man to handle two machines or check and inspect parts while lathe is running.

Acme Industrial Co, 200 N Laflin St, Chicago, Ill

including...

MACHINE TOOLS AND ATTACHMENTS

Drilling and Tapping Machine 164
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Crankpin Grinding Machine 166
Oscillating Lapping Machine 170
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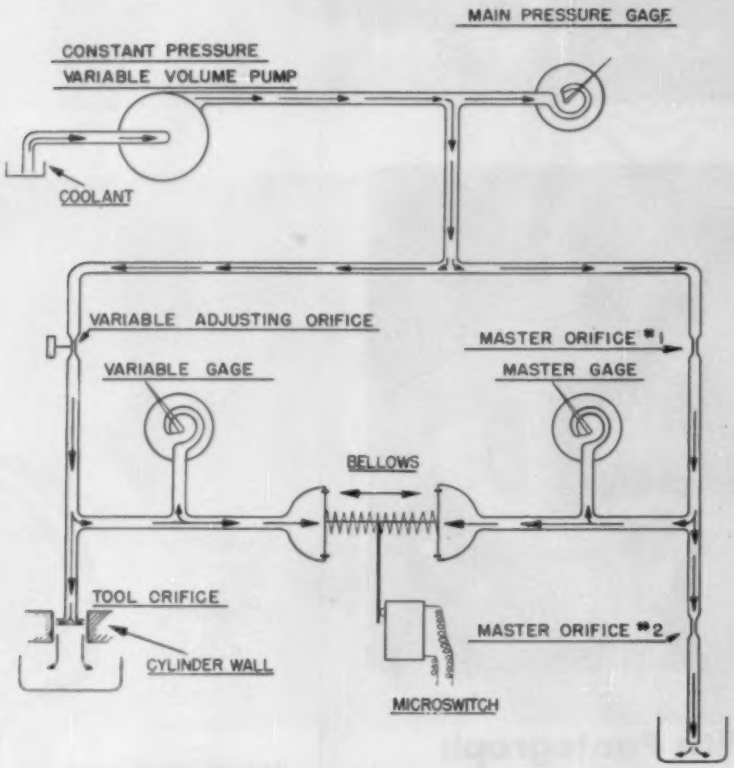


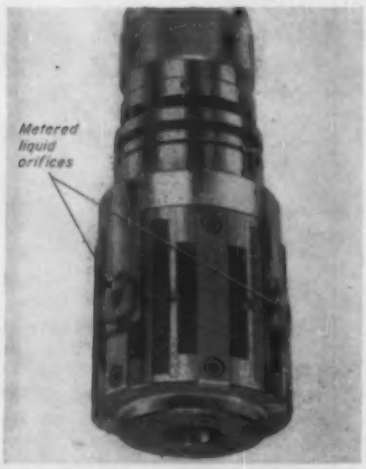
Barnesdril Liquid Sizing System Gages Diameter of Honed Bores

Improved method for gaging honed bores is known as Liquid Sizing and is capable of automatically gaging the diameters of bores throughout their full length as honing progresses. As shown in the schematic, the system supplies coolant at a constant pressure to both the tool and the master gage. Back pressure, created by forcing coolant between tool and walls of cylinder, affects the expansion of the bellows.

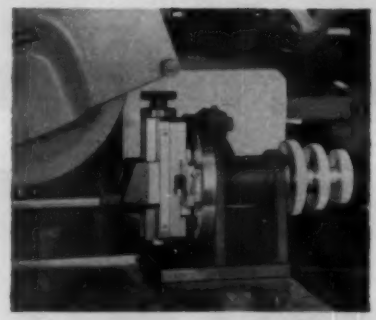
As honing progresses, distance between the tool and the wall increases, causing back pressure to decrease and bellows to expand. A point is reached where this variable pressure balances a pre-set pressure on the master gage. At this point, a microswitch is tripped to stop the honing machine cycle; the tool continues for one full additional stroke. If any part of the bore is not to size, the microswitch reactivates the cycle and the honing continues until entire bore is to size.

Liquid Sizing offers several advantages over other methods of gaging. Coolant is flooded over cylinder walls at the most critical point during the honing cycle, thus affording better heat control. This also provides continuous flushing which materially increases the stone life and provides better micro-finish control.

Barnes Drill Co, 830 Chestnut St, Rockford, Ill



HONING TOOL is the new plate type designed for easy replacement of stones and for low tool maintenance. Coolant flows into bore through metered liquid orifices

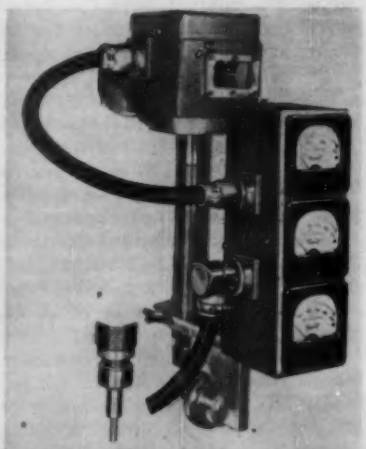


Direct-Reading Scales on Dresser Simplify Setups and Operation

Tangi-Matic dresser is designed to reduce precision dressing of grinding wheels to a simple routine operation. Accuracy is assured by form-dressing at the bottom wheel, which is the point of contact for grinding, thus eliminating errors on grinders where the spindle is not true with the chuck. All corners on tool are undercut to facilitate cleaning.

Unit can be operated either right or left handed, making it possible to dress wheels with either cw or ccw rotation. Once diamond is zeroed to master setting block, all radius settings are made on the direct-reading micrometer-type adjustment, and all angular settings on the direct-reading dial and vernier. Dresser can also be used as a grinding fixture.

Threadwell Tap & Die Co, Greenfield, Mass



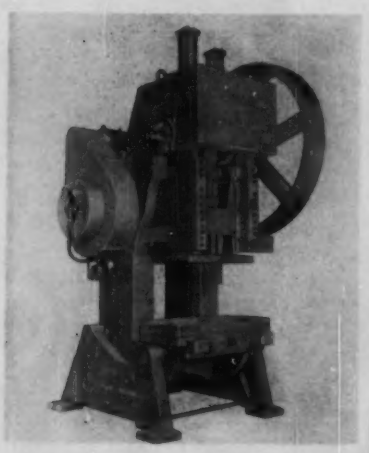
VISUAL INDICATOR ATTACHMENT mounts on tracer unit head of company's Duplimatic tracer control devices and gives visual readings on each of the three movements of the stylus. Unit may be installed on existing machines or specified on new machines—*Tracer Control Co, 595 East 10 Mile Rd, Hazel Park, Mich*

Starbore Carbide Drill Produces Precision Blind Holes

Center-Cut carbide drill, designed to produce precision holes from the solid in applications where a pin is not desirable, is reported to be suited for drilling blind holes; holes that intersect cross holes, recesses, or cored areas; holes in laminated sections; and similar operations where pin disposal presents a problem.

Hole in drill, through which pressurized coolant is carried, is placed sufficiently off-center to prevent the forming of a pin. Carbide tip is a molded blank that is brazed to tubular shank. Typical drill is reported to drill blind holes in cast iron to 0.0005-in. size tolerance at a feed of 15 ipm; surface finish is 30 mu-in. rms. Drills are made to specification in a variety of sizes and lengths, and can be supplied with either straight or taper shanks.

Star Cutter Co, 34500 Grand River Ave, Farmington, Mich

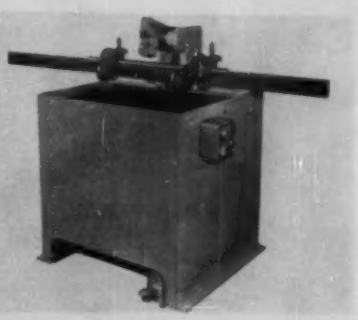


Johnson 150-Ton Inclinable Press Has 22-in. Standard Die Space

Model 150 open-back, inclinable press has a capacity of 150 tons, and features a box-type ram, air clutch, air-actuated spring-set brake, and 110-v electrical controls. In addition, it is equipped with replaceable bronze inserts at pitman and journal bearings. Press offers a standard die space of 22 in. with a maximum of 39 in. available on special order.

Offered exclusively in the geared type, unit has a standard 6-in. stroke (max stroke available is 12 in.). It has a flange ram face and box-type ram which measures 34 x 24 in. Bolster plate is 50 x 30 x 4½ in. and the opening through the uprights is 26 in. Bulletin available.

Johnson Machine & Press Corp, Elkhart, Ind



Press is Adaptable to Assembling, Straightening, and Cold Riveting

New series of air or hydraulic, desk-type production presses for precision straightening, assembling, cold riveting, available in 10 and 20-ton sizes, is designed for easier hand or automatic loading or unloading, particularly from overhead.

Parts to be straightened are held in manual or air-operated centers or rollers while indicators show amount of distortion or deflection necessary. Pressure is applied directly where needed through a single head on a rolling carriage (illustrated) or through multiple heads adjusted longitudinally to meet requirements. Standard shop air pressure of 80 psi is adequate for maximum press capacity; or all models can be equipped with low-pressure, hydraulic pump units.

General Mfg Co, 6438 Farnsworth Ave, Detroit 11, Mich

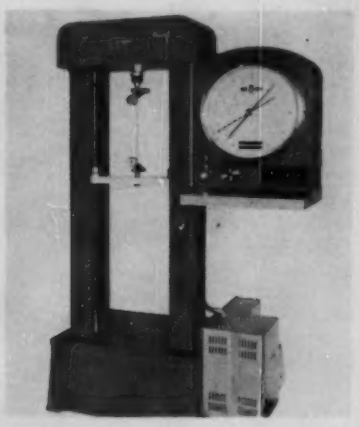
Nickel-Alloy Cladding Resists Corrosion, Doubles as Brazing Alloy

Nickel - alloy coating, designated Niphos, is easily applied to ferrous metals parts of all sizes and shapes. After application, material is heated in a reducing atmosphere to provide a tightly-adhering nickel-alloy cladding which will not peel or flake even when subjected to a 180° bend.

Clad coating can be applied locally to areas which are to be joined by brazing, after which the brazing operation is completed by merely placing the coated areas in contact and heating them.

Average coatings, applied mainly for corrosion protection, are about 0.001 in. thick, but coatings up to 0.025 in. can be obtained in one application. Coatings can prevent scaling of the base metal at temperatures as high as 1150 F. Coated areas, when properly welded, suffer no loss of corrosion protection in the weld-affected area.

Tube Reducing Corp, Wallington, NJ



Low-Capacity Testing Machines Feature Electronic Load Indication

Lo-Cap line of electro-mechanical testing machines is available in capacities from 100 to 5000 lb. Machines feature electronic load indication on large dial. Each machine has two range capacities—full and 1/5 or ¼ capacity, indicated on same dial. Range may be changed at will during test with flip of switch.

Infinitely adjustable testing speeds of from 0.3 to 12 ipm are electronically controlled and are positive under load and no load. Machines are available as universal testers, or as special tension, compression, or flexure testing machines. Horizontal testing clearance of 15 in. is provided between screws, with an unlimited stroke of up to 36 in. in tension or compression. Units may be equipped with electronic or mechanical recorder, if desired, for plotting stress-strain curves.

Tinius Olsen Testing Machine Co, Easton Rd, Willow Grove, Penna

Cooper Weymouth Straightener Flattens Small Metal Stampings

Straightener is a bench-height, motor-driven, self-contained machine designed to straighten small stampings that have become distorted during processing. Six-in. stock-width model will flatten parts as thin as 0.010 and as short as 2 in. to within 0.001 to 0.002 in. in most cases. The 8 and 12-in. models will flatten parts as short as 3 in.

The 17 straightening rolls and the two feed rolls are all power driven. Single-point adjustment easily and positively applies and sets the pressure to the top bank of rolls. They have variable-speed drives and reverse switches.

Machine can be supplied with either flat or angular head. Any model can be made into a portable unit; free-loop arm can be attached to enable machine to act as coil and strip-stock straightener.

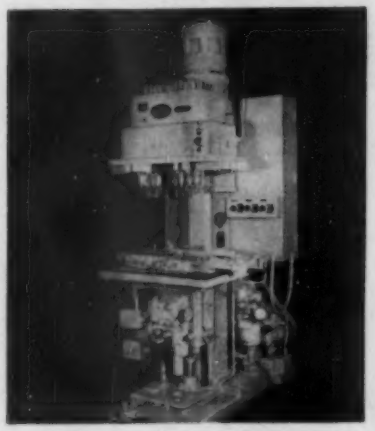
Cooper Weymouth, Inc, 600 Honeyspot Rd, Stratford, Conn

Linde Oxweld Nozzles Increase Flame-Cutting Speeds

Increased flame-cutting speeds are possible with complete selection of new Oxweld 2-piece nozzles. Each of the 2-piece nozzles has from 12 to 20 extremely small outlets for preheat gases. This feature increases rate of heat transfer and produces a nearly solid ring of preheat flames.

Gases usually leave a cutting nozzle at a speed of about 980 fps, but design of new nozzles boosts this speed to 1200 fps. Two-piece construction cuts replacement costs and simplifies cleaning.

Linde Co, Div of Union Carbide Corp, 30 E 42 St, New York 17, NY



DRILLING AND TAPPING MACHINE, Model H-6, is now available with preset selective cycle control and a straight-line indexing slide. Over 100 combinations of operations are possible; functions include drill, tap, step drill, chamfer, countersink, counterbore, spotface, and skip—*National Automatic Tool Co, Inc, Richmond, Ind*

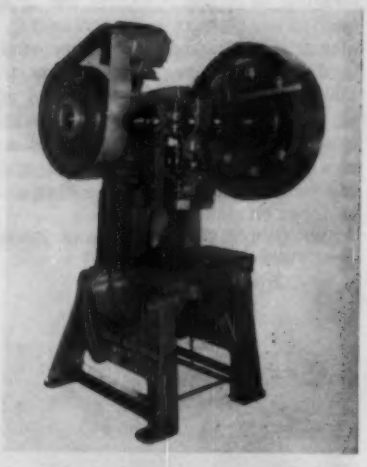
Barker Introduces Heavy-Duty ¾-hp Milling Machine

Model A-M milling machine has a head travel of 6 in., table travel of 10 in., and a saddle travel of 4½ in. Machine takes No. 30MM standard adapters and will accommodate most standard indexing heads, vises, and other accessories. Over-all height is 57 in. and total weight is 650 lb including the optional cast metal base. Table working surface is 6 in. wide by 20 in. long. Micrometer feed screws can be installed on any travel at slight extra cost. Coolant system is available at extra cost.

Barker Engineering Co, 500 Green Rd, Cleveland 21, Ohio

Warner electric clutch-brake is now available as optional equipment on company's Series 308 straightening machines. Attached to lower pinch-roll shaft, device permits machine to operate as an automatic feeding unit, supplying stock to punchpress or shear using a die with a positive stop.

F J Litell Machine Co, 4127 N Ravenswood Ave, Chicago 13, Ill



Back-Shaft Bearing Supports Are Integral Parts of Press Frame

Operating at approximately 45 spm, new Press-Rite 37-ton open-back inclinable backgeared press is said to be ideal for dial feed or other automatic feed equipment. Designed for drawing parts and other backgeared applications, press has Unicast alloy frame, 3¼-in.-dia crankshaft, and 14 x 25-in. bolster.

Standard stroke is 2½ in. but can be increased to 4 in.; standard shut height is 10 in. but can be increased to 20 in. Making the back-shaft bearing supports integral parts of the frame is said to provide greater strength and longer life.

Sales Service Machine Tool Co, Press-Rite Div, 2363 University Ave, St Paul, Minn

FYI

FOR YOUR INFORMATION

Use These Reader Service Cards for Your FREE Copies of Catalogs, Booklets, Charts, Calculators

To get the ones you need just list number of each booklet described on this and the following pages. When you have filled out card, simply detach and mail. We'll do the rest. Postage is prepaid.

MACHINES AND ATTACHMENTS

1 HYDRAULIC WHEEL PRESSES—*Farrel-Birmingham Co, Watson-Stillman Press Division, 109 Aldene Rd, Roselle, NJ.* 8-page bulletin 530-B illustrates and describes standard inclined wheel units in capacities from 100 to 800 tons.

2 36-IN. TILTING ROTARY TABLE —*Pratt & Whitney Co Inc, Charter Oak Blvd, West Hartford 1, Conn.* Bulletin covers unit for large jobs requiring precise circular spacing and angular positioning; power tilt is from 0 to 90°; power rotation through a full 360°.

3 PLASTICS INJECTION MOLDING MACHINE—*Hydraulic Press Mfg Co, Mount Gilead, Ohio.* 6-page bulletin 5720 gives details on new H-P-M 20/28-oz-capacity Model 450-HV-20/28. Features, specifications, standard and optional equipment covered.

4 THREADING HEAD—*Landis Machine Co, Waynesboro, Penna.* Bulletin F-98 pictures and describes the 5C Landmatic taper attachment die head designed for small automatics employing a stationary die head; has pipe threading range of ⅛ to ¾ in. Design and operating features detailed.

● EXPANDERS — *Grotnes Machine Works Inc, 5454 N Wolcott Ave, Chicago 40, Ill.* 16-page bulletin 557 contains illustrated descriptions of mechanically and hydraulically powered units. Describes expanding principle; discusses selection, operation, and tooling, plus data on special types of machines. Includes glossary of terms, and tabular facts on comparative specifications and capacities. Request direct on company letterhead.

5 AUTOMATIC COMPRESSION MOLDING PRESS — *F J Stokes Corp, 5500 Tabor Rd, Philadelphia 20, Penna.* 4-page bulletin 201 contains illustrated description of 25-ton air-operated Model 725 for short production runs.

6 POWER SQUARING SHEARS — *Peck, Stow & Wilcox Co, Southington, Conn.* 4-page bulletin 57 describes features and gives specifications for three Pexto models that take 4, 6, and 10-ft lengths of stock; capacity mild steel is 12, 14, 14; stainless, 16, 18, 18.

7 CAM GENERATOR—*Stouby Manufacturing Co, Machine Products Division, 4595 Easton, St Louis 13, Mo.* 4-page bulletin illustrates and describes the Gen-A-Cam, a device for grinding or milling accurate and constant rises on plate cams. Unit is graduated in hundredths or degrees; 1-in. or 20-mm spindle.

TOOLS AND ACCESSORIES

8 GRINDING WHEELS — *Cincinnati Milling Products Division, Cincinnati Milling & Grinding Machines, Inc, 4701 Marburg Ave, Cincinnati 9, Ohio.* 36-page illustrated brochure PG-320 contains detailed data on PD grinding wheels and the Positive Duplication manufacturing process. Discusses wheel markings and meanings, wheel types and uses, characteristics of incorrect wheel gradings and grinding faults, wheel mounting, dressing methods.

9 CARBIDE TIPPED SAWS & TOOLS —*R Hoe & Co, Saw Division, 910 E 138th St, New York 54, NY.* 24-page booklet covers units for cutting wood, fiber, plastics, and non-ferrous metals. Specific material cutting data included as well as ordering information.

10 CUTTING TOOLS—*Gairing Tool Co, 21330 Hoover Rd, Detroit 32, Mich.* 20-page standard tool catalog covers end-cutting tools, block-type boring tools, and face mills. 16-page spade drill catalog describes spade drills, Conner-type core drills, and deep hole tooling. 16-page special tool catalog illustrates examples of special production tooling.

11 GEAR CHUCKS—*Garrison Machine Works, Dayton 4, Ohio.* Literature includes booklet describing bevel gear chucks and folder of illustrated data on special gear jobs.

12 STANDARD JIG AND FIXTURE COMPONENTS—*Northwestern Tool & Engineering Co, 114 Hollier Ave, Day-*

Fill in number of each bulletin wanted

Name _____

Title _____

Company _____

Business Address _____

City _____ State _____

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FYI — FOR YOUR INFORMATION

ton 3, Ohio. Conversion chart cross-references identical items that can be supplied by eight leading manufacturers of jig and fixture components.

13 ULTRASONIC GAGING — *Branson Instruments, Inc, 40 Brown House Rd, Stamford, Conn.* Application data sheets discuss uses of the Vidigage, an ultrasonic resonance instrument, for quick and accurate detection of corrosion and laminar flaws, and measuring of metal or plastic thicknesses.

14 STANDARDIZED UNITS FOR AUTOMATIC ASSEMBLY—*Dixon Automatic-Tool Inc, 8300 23rd Ave, Rockford, Ill.* 4-page illustrated bulletin B-1 describes air-operated Auto-Positioner which places piece-parts from 1/16 to 3 in. at speeds up to 6000 per hr. Details given also on the Auto-Driver, an automatic screwdriver for handling nuts and screws up to 5/16-in. thread size. Data on standardized adjustable machine bases and columns with various brackets which simplify mounting pieces of assembly equipment is included.

15 CARBIDE TOOLS & DIES—*Jaquith Carbide Division of Pratt & Whitney Co, 19 Stewart St, Lynn, Mass.* 8-page illustrated bulletin discusses advantages of Jaquith-designed dies of all types. Production methods pictured and described.

HEAT TREATING AND WELDING

16 WELDING BLOWPIPES—*Linde Co, 30 E 42nd St, New York 17, NY.* 6-page folder 1007 describes three Oxweld units that operate at acetylene pressures less than 1 psi. Attachments that convert these blowpipes from welding to flame-cutting operations on all thickness of metal up to 8 in. are also described.

17 WELDING ROD COMPARISON CHART—*American Chain & Cable Co, Page Steel & Wire Division, Monessen, Penna.* 4-page folder, bulletin DH-1218-K, details physical properties as welded, gives analysis, tensile strength, elongation, Rockwell hardness, lists typical uses of gas welding rods, bare electrodes, automatic welding wire and metal spray wire.

18 WELDING POSITIONERS — *Aronson Machine Co, Arcade, NY.* 4-page bulletin FT57 illustrates and describes floor turntables in capacities from 1000 to 130,000 lb. Applications and specifications included.

PARTS AND MATERIALS

19 TITANIUM FACT FILE—*Mallory-Sharon Titanium Corp, Niles, Ohio.* 24-page booklet gives data on physical, mechanical, and corrosion properties; metallurgy; machining; production information on machining, forming, and welding. Tabular data includes comparison of titanium's physical properties with those of other pure metals; mechanical properties for annealed titanium and its alloys.

20 CLUTCH AND BRAKE UNIT—*E W Bliss Co, Canton, Ohio.* 4-page illustrated bulletin 37-A contains informative data on Type K pneumatic model that can be either outboard or crankshaft mounted. Features of the single disk press clutch described.

21 ROLLER CHAINS AND SPROCKETS—*Diamond Chain Co, 402 Kentucky Ave, Indianapolis 7, Ind.* 68-page catalog 757 describes and illustrates line of stock chains and sprockets. Includes data on selection, establishing service up required, determining size of driven sprocket.

22 STANDARD ELECTRIC MOTORS—*Sterling Electric Motors Inc, 5401 Telegraph Rd, Los Angeles 22, Calif.* 12-page brochure describing complete line illustrates variety of applications. Design advantages and features discussed.

23 CRACKING HAZARDS IN TOOL AND DIE MAKING — *Carpenter Steel Co, 509 W Bern St, Reading, Penna.* 8-page brochure discusses means of eliminating cracking hazards. Contains detailed information on design, how to make the tool, heat treatment, and selecting the steel. Cracks illustrated, causes explained.

24 GEARMOTORS AND PACKAGE DRIVES — *Westinghouse Electric Corp, PO Box 2099, Pittsburgh 30, Penna.* 8-page booklet DB-3650 illustrates and describes horizontal, vertical, right angle, open, enclosed, explosion-proof, ac and dc units with their respective reduction ratios and output speeds. Units range in speed from 7.5 to 780 rpm.

25 HIGH VACUUM VALVES — *NRC Equipment Corp, 160 Charlemont St, Newton 61, Mass.* 32-page engineering manual covers complete line including globe, gate, swing disk, slide, and ball closure. Available in steel, stainless, bronze, aluminum, and PVC in sizes from ⅛ to 20 in.

● WIRE CLOTH — *Cambridge Wire Cloth Co, Cambridge, Md.* 94-page illustrated catalog covers complete line of industrial wire cloth, screens, and wire cloth products. Describes types and sizes, typical applications; contains a number of useful metallurgical tables; includes standard trade definitions and ordering information. Request direct on company letterhead.

26 HEAVY - DUTY PRECISION SWITCHES—*Micro Switch Division of Minneapolis-Honeywell Regulator Co, Freeport, Ill.* 4-page illustrated folder gives data on six series with descriptions of various types, and applications

MISCELLANEOUS

27 TOOL GRINDING AND MODIFICATION SERVICE—*Niagara Cutter Division of Bullier-Damerell, Inc, 230 Niagara St, N Tonawanda, NY.* Bulletin TS-57 describes service and gives delivery schedule. Modification and sharpening of milling cutters, end mills, reamers, counterbores, hobs and broaches, as well as special grinding is done.

28 WELDED FABRICATION — *Acme Welding Division of United Tool & Die Co, 1021 New Britain Ave, West Hartford 10, Conn.* 17-page booklet illustrates and describes complete fabrication facilities. Advantages discussed, applications pictured.

29 FOREIGN EQUIPMENT—*Kurt Orban Co, 24 Exchange Place, Jersey City 2, NJ.* 14-page illustrated booklet discusses operation and services of company in assisting American manufacturers to bypass problems that might arise in buying foreign products. Lists company divisions and their products.

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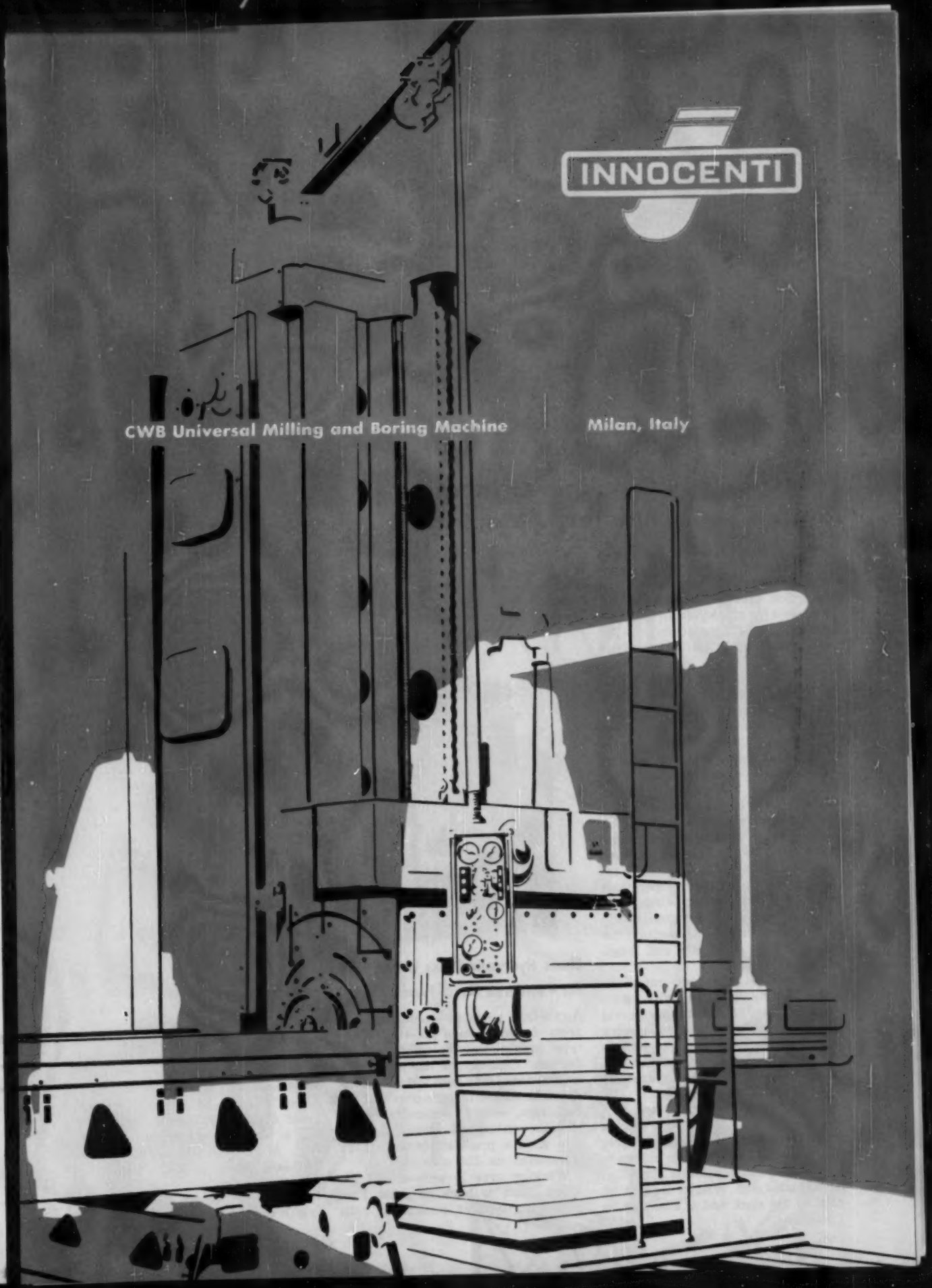
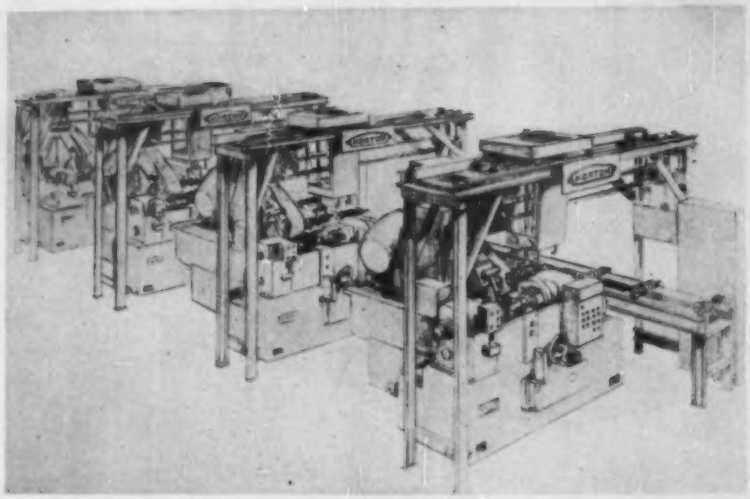

INNOCENTI
CWB Universal Milling and Boring Machine
Milan, Italy



Transfer-Type Crankpin Grinding Machine is Completely Automatic

Norton No. 2 transfer-type automatic crankpin grinding machine is capable of completely automatic, high production, precision grinding of automotive-type crankpins. In grinding 4-pin crankshafts, machine is designed to finish grind 240 pins per hr.

Machine consists of separate, self-contained, easily regulated units, each of which grinds a single pin. Units, any of which may be cut out of service without affecting operation of others, are connected only by conveyor which carries cranks between units.

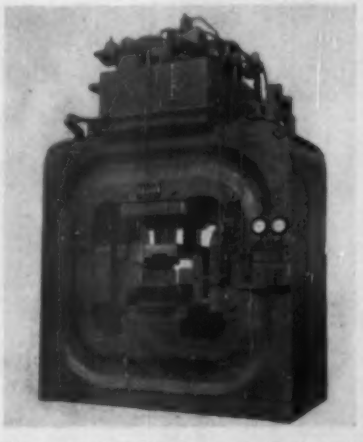
Faster work loading and unloading is possible because of a double-hook loading mechanism. An unground crank is placed in the workholders as soon as the ground crank is removed. All transferring operations are done during the grinding cycle. Loading mechanism automatically locates work in correct position for grinding both angularly and longitudinally.

Other features include automatic wheel truing coupled with wear compensation, constant peripheral wheel speed, balanced-torque work spindle drive, and a complete system of safety interlocks to shut machine down in case of malfunctioning. Catalog 2350 available.

Norton Co, Worcester 6, Mass

Stud driver called Mustang drives studs where limited space demands a driver of small diameter. Tool can be adjusted for various lengths of grip on the stud, and is available in two sizes for hand or power use: No. 1 has max capacity of ⅜ in.; No. 2 has max capacity of 9/16 in.

Titan Tool Co, Fairview (Erie County), Penna



Elmes Hydraulic Press Is Designed For Powdered Metal Forming

Angle-type powdered metal forming press features rigid all-steel box-type construction to minimize deflection. Capacity of the main ram is 1000 tons, side ram 750 tons. Independent hand lever is provided for each ram, with a mechanical interlock preventing movement of main ram until a predetermined tonnage is reached on the side ram.

Working area is accessible from either front or back of press. Proportioning type of control on both rams permits easy setup of dies (interlocked control is removed during setup). Both rams have rapid approach speeds, with slower speeds for pressing, and a rapid return speed. Press is available in variety of die spaces and tonnages; a third or bottom-pressing cylinder can be provided.

American Steel Foundries, Elmes Engineering Div, Cincinnati 29, Ohio

Operator-Led Trucks Are More Compact Than Former Models

By incorporating an all-gear power unit in its line of operator-led trucks, company has been able to reduce length by 3¼ in. Models WT-2A and 4A measure only 35½ in. in length. Model WT-2A has a rated drawbar pull of 200 lb with an ultimate of 700 lb, while its companion, the WT-4A has a normal drawbar pull of 400 lb with an ultimate of 700 lb. This doubles the old normal rating. Trucks can make a U-turn in a 4-ft aisle.

Automatic Transportation Co, Div of Yale & Towne Mfg Co, 149 West 87 St, Chicago 20, Ill

Lowcost Cutoff Wheels Have Hardness of R_c 55-56

Quick-Shear wheels, product of a manufacturing process reported to cut costs of cutoff wheels by 25 to 50%, are designed for use on all rotary pipe and tube cutoff machines, and are available in all standard sizes. Manufacturer guarantees R_c 55-56 hardness for each wheel, and claims them to be practically chip-proof. Cleaner and faster cutting are said to be result of high chrome content. A 6-in.-dia, ⅛-in.-thick double-bevel wheel with a 1½-in. bore lists for $5.50 in lots of six.

Quick-Shear Wheel Co, Dept CC3, 5240 Winona St, Chicago 30, Ill

INNOCENTI

Equipment for Steel Plants

Continuous Casting Machine Concast Ltd. (Zürich) Licenser

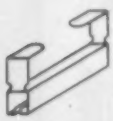
OPERATING SEQUENCE: *Part is loaded into machine (left); ram comes down and rotating jaws wrap sides of part around mandrel (center); jaws and ram return simultaneously and mandrel retracts, stripping the part*

Semi-Automatic Bending Machine Features Rotating Bending Action

The Husky Rotomatic bending machine is designed to bend small electrical contacts of extremely intricate shape (see sketch) but can also be used for cutting and piercing operations up to 2 tons, and can be fitted with a variety of feed mechanisms. Outstanding feature of the machine is the inexpensive tooling required—savings of about 75% are reported when compared with conventional tools—only small flat-ground stock pieces are required. Over and under-bend can be adjusted by limiting the travel of the rack; travel of the segments is up to 110°. The rotating bending action permits very brittle material to be bent and is said to yield a much stronger bend than conventional dies.

The electrical contact was done in two steps, as shown. Complete tooling expense was $300, and production rate is 1500 per hr. Material of

1st operation



2nd operation

different thickness and hardness can be bent with the same tooling by simply adjusting the rotation travel.

In operation, sliding feed mechanism pushes the part into the machine and ram comes down to clamp part. Jaws wrap sides of part around mandrel—rotating action of jaws is actuated by a rack which is driven by an air cylinder. Then the jaws and ram return to starting position simultaneously. Mandrel retracts, stripping the part, and the part falls into a collecting bin.

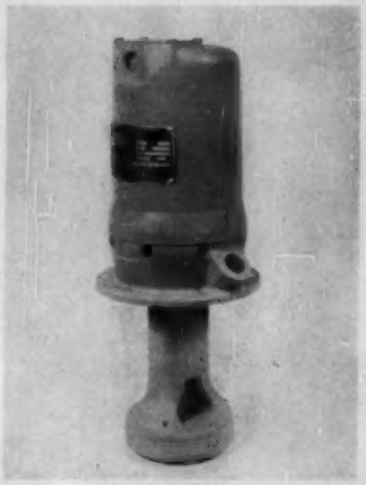
Husky Mfg & Tool Works Ltd, 5870 Yonge St, Toronto, Ontario, Canada

GE Magnetic Motor Starters Are Smaller Than Previous Open Forms

Designed for use with machine tools, pumps, hoists, saws, and other industrial equipment, these new NEMA Size 0 and 1 magnetic motor starters are 42% smaller than previous open forms. Open form measures 4½ in. high by 5 3/32 in. wide. Enclosed form is 7¼ in. high, 6½ in. wide, and 4⅝ in. deep.

Size 0 is rated up to 5 hp at 440 v; Size 1, 10 hp at 440 v. Units come in contactor, non-reversing, reversing, combination, and multi-speed forms. Important features include "snap-slide" construction in which all main components snap or slide together; wrap-around cover with spring latch; straight through wiring for speedy installation; vertically slanted contacts which give higher tip pressure and reduce possibility of contact welding. Starters can be mounted in any position and routine inspections can be performed without using tools. Overload trip setting can be adjusted up to plus or minus 15% of nominal heater rating by turning a knob. Nine field modification kits are available.

General Electric Co, Schenectady 5, NY



Submerged-Type Centrifugal Pump Supplies Coolant to Machine Tools

Vertical submerged-type centrifugal pump, called the Midget Hi-Flow, is equipped with an integral ⅛-hp 3-phase or 1/10-hp single phase motor. Motor is totally enclosed with an NEMA standard flat face mounting and is designed for continuous duty.

Unit is designed for immersion in liquid to depth of 5¾ in., with the motor mounted 2 in. above maximum liquid level. Liquid flows from impeller through two cored passages within pump body, with a ½-in. pipe connection above the mounting flange. Pump is suitable for supplying coolant for machine tools and light machinery, for use where dirt or abrasives may be present in the liquid, and for light transfer work. Specification sheet P 9 available on request.

Brown & Sharpe Mfg Co, Providence, RI

Utility shelf, called Piv-O-Tray, attaches to drillpress columns, machine bases, lathes, and other machines. Tray, which can be positioned at touch of a finger, is 10 x 10 in. and will support more than 50 lb. Unit is made of 16-gage steel.

E V Nielsen, Inc, Stamford, Conn

THIS PLANT MANAGER SAYS:

"We do things with our SKILSAW we can't do with a $10,000 machine!"

This is the metal cutting experience of Charles Geisler, plant manager, The Metal Equipment Co., Cleveland. He further states: "Our SKILSAW Model 825 paid for itself on the first job. We eliminated excessive handling and saved material. If no more SKIL Saws were available, no one could buy mine!"

The problem was to make right angle cuts in 1¼" aluminum alloy plate sheets, 4' x 8'. The cut pieces were fed into a band saw for circular cutting. Cuts as close to the pattern lines as possible were necessary to get the most out of the 4' x 8' sheet. After trials with other saws, SKIL Model 825 made the angle cuts with the least amount of waste.

This experience means great savings to this company—savings in material, time and money. You, too, can SAVE with SKIL tools. Ask a SKIL distributor to show you the features that mean savings to your plant. Or simply write SKIL direct for a free industrial power tool catalog: Dept. AM-87, SKIL Corporation, 5033 Elston Avenue, Chicago 30, Illinois.

On any plant operation... you SAVE with SKIL Tools

SKIL PORTABLE TOOLS

Made only by SKIL Corporation, manufacturer of famous SKIL and SKILSAW products, 5033 Elston Ave., Chicago 30, Ill. In Canada: 3601 Dundas St. West, Toronto 9, Ontario.

Oscillating Lapping Machine Multiplies Cutting Tool Output

Hyprez machine for lapping and refinishing of carbide or ceramic cutting tools features Meehanite lapping wheels that oscillate as they rotate —with a controlled variation of stroke from 0 to 1 in. Rotating wheel moves across the edge of the tool or insert while it is held firmly in a precise position, reducing the possibility of error as in manual operation. Protractors for horizontal and vertical planes assure correct angles, straight edges.

Without distorting the geometry of tool, the top, lands, and radii can be finished to 1 mu-in. in 2 min or less. Hyprez techniques reportedly increase tool output per grind 200 to 700%; improve speeds and feeds 50 to 400%; and assure finer finishes and closer tolerances on end products.

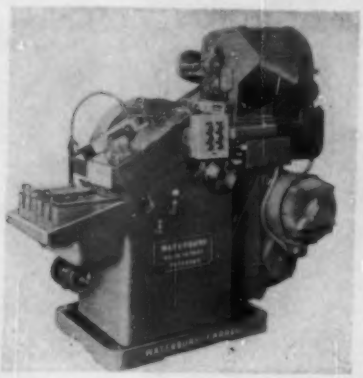
Engis Equipment Co, 431 S Dearborn St, Chicago 5, Ill

Sectionalized Tube Furnace Heat-Treats Coil or Strip Stock

Sectionalized tube-type electric furnace provides flexibility for any individualized requirement for heat-treating wire, rod, or strip steel on continuous-run schedule. Assembled of sectional units, of either 5 or 11-ft lengths, each having its integral controls, furnace can be adapted to suit operating conditions.

Over-all dimensions of a typical unit, with max operating temperature of 1250 F, is 17 in. wide, 17 in. high (plus legs), and 11 ft long. Muffle is 6-in.-ID alloy tubing for full length. Power requirements are 30 kw, 220/60/3.

Pereny Equipment Co, 893 Chambers Rd, Columbus 12, Ohio



Rotary Die Threader Rolls 60 to 600 Screw Blanks per Minute

Machine, utilizing a circular die and die segment, can thread all types of machine screws as well as other headed parts. Unit will handle blanks from ¼ to 2 in. long and thread diameters from No. 6 to ¼ in. Production rates on blanks of conventional screw materials range from 200 to 600 per minute; stainless can be threaded at from 60 to 200 per min.

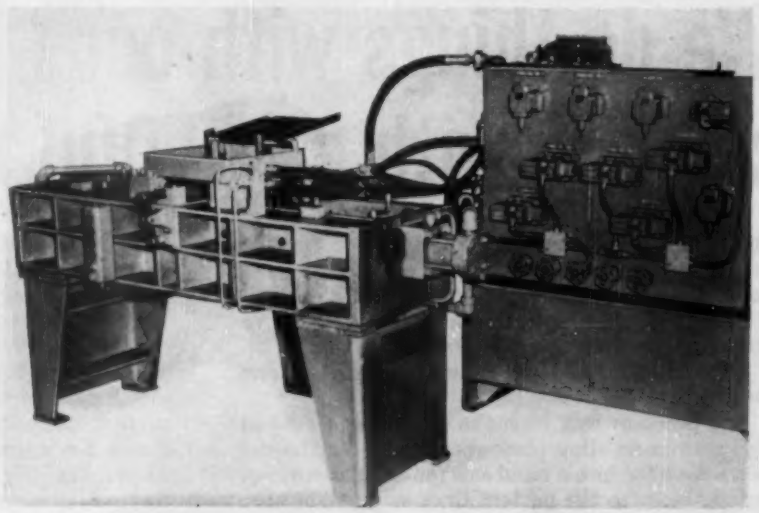
Safety device on flywheel protects dies if an oversize, bent, or deformed blank comes through the feeding chute. Separately driven rotor vane feed is used, and four-step pulley arrangement allows operator to select feeding speed. Unit is normally equipped with a variable speed motor drive to permit varying production speeds; it can be supplied with single speed motor if desired.

Waterbury Farrel Foundry & Machine Co, Waterbury, Conn

Instrument Checks Thickness of Anodic Coatings on Aluminum

Rohco Anodicator provides a reliable method of testing anodized aluminum and its alloys. Unit automatically checks thickness of coating by dielectric spotchecks. Instrument provides a uniform, slow rate of voltage increase, and a uniform pressure of the probe on the anodic surface. Models are available with capacities of 1000, 2000, and 5000 volts.

R O Hull & Co, Inc, 1300 Parsons Court, Rocky River 16, Ohio



DOUBLE-END TUBE FORMING MACHINE, Series 700 Automatic, is hydraulically operated. Tube is transferred from gravity magazine to work position, clamped, formed, and ejected automatically. Unit can be arranged for double operation work through use of double-stroking work slides with indexing of forming tools between each stroke. Production rates up to 1500 pieces per hr have been attained. Machine can be tooled to expand and reduce in dia, bead, flare, and flange ends of tubing in various sizes and lengths—*Vaill Engineering Co, 137 E Main St, Waterbury 20, Conn*

Why Lindner Optical Jig Borers have changed so many ideas about jig boring

204 holes located and jig bored in 65 hours
Tolerances between holes .00015"
Overall tolerances .0002"
Chassis blanking die 23" x 22"

MODEL LB15 (WITHOUT AUTOPOSITIONER) AT MIDDLESTADT

You're looking at the *third* Lindner Optical Jig Borer at work for Middlestadt Machine Co., Baltimore. And you'll see *seven* Lindners at General Electric; *five* at North American Aviation; *three* at Avco; others at General Mills, Lockheed, Vectron, Bendix—and a growing list of more precision-minded plants. Here's why:

Optical measuring system does not depend on lead screws, gage blocks, bars or limit switches—is permanently protected against mechanical wear. Only a light beam touches helically scribed cylindrical measuring scales which are independent of table movement mechanism and are *immovable* in axial direction.

AUTOPOSITIONER® enables operator to preselect table position for next hole while one boring operation is in progress—eliminates non-productive time between holes. As one hole is completed, table moves in rapid traverse to the next preselected position. (Available only on model LB15A)

Photo-electric optical centering device minimizes visual fatigue and errors in settings—permits initial and repeat settings guaranteed accurate within .00015" and readings in .00005".

Projection screen eliminates operator eye strain and bending—helical line from measuring scale is projected on 2½" x ¾" screen which operator reads in standing position without eyepiece.

Automatic table clamping prevents errors in clamping and unclamping table between movements.

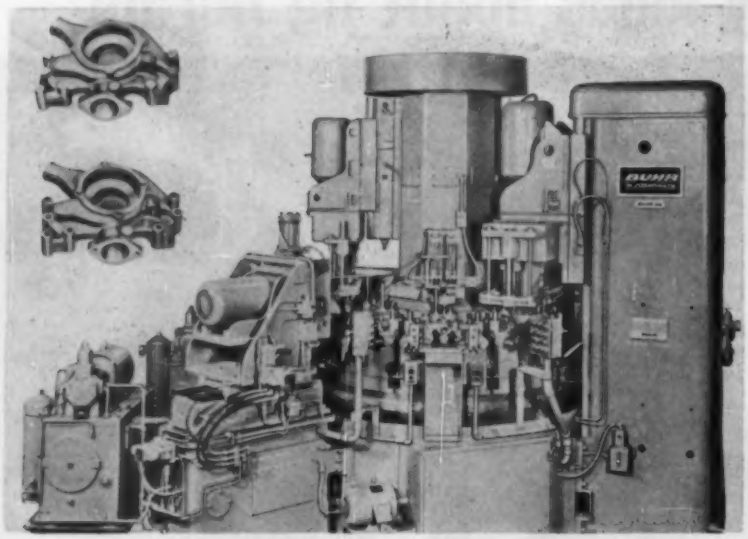
Lindner Optical Jig Borers are available in two models:
LB15A with Autopositioner—Table size 44" x 24"
LB14—32" x 16" (without Autopositioner)

● ***Send for 25-minute movie film demonstration***

KO CO., INC. INDUSTRIAL IMPORTERS

KURT ORBAN COMPANY, INC.

36 Exchange Place, Jersey City 2, N. J. • In Canada: 2490 Eglinton Ave. W, Toronto



Economatic Machines Pump Housings, Has Detachable Index Unit

Buhr Economatic provides example of how special machinery may be custom designed but still be adaptable to machine other parts. The automatic index unit to actuate table is readily detachable and may be removed without disturbing any other part of the machine. Processing 102 pieces per hr at 100% efficiency, this machine was specifically built to perform the following 55 operations on an automotive water-pump housing, after mounting pads have been previously ground—1 milling, 18 drilling, 10 reaming, 7 chamfering, 10 tapping, 7 spotfacing, and 2 boring operations.

Other features include automatic clamping of parts, automatic lubrication of fixtures and all moving parts, steel hardened-and-ground detachable ways, complete interchangeability of standard and special parts, automatic chip removal, and JIC hydraulic and electrical standards.

Buhr Machine Tool Co, Ann Arbor, Mich

Let-Up Control on Press Brake Stops Whipping of Sheet Materials

New accessory called Let-Up Control fits all hydraulically operated Di-Acro press brakes and is said to eliminate whipping and resultant kinking of sheet material during forming operations. Basic element is an adjustable flow-control valve. Long sheets can be handled because the speed of the ram can be reduced by as much as 50% just prior to the time that the die in the ram makes contact with the material. While the form part of the stroke is at slow speed, return stroke is at maximum speed.

Adjustment of the control is made on a calibrated gage which is mechanically linked to a 2-way valve which opens and closes to allow hydraulic oil to flow through the control valve.

O'Neil-Irwin Mfg Co, 512 8th Ave, Lake City, Mich

Cast-Iron Collets Reduce Marking And Scratching of Workpieces

Fine-grain cast-iron collets reportedly reduce or prevent scratches and marks on stock being processed in company's cut-off machines. Collets are divided into 5 moving segments, to provide positive gripping of stock that may be slightly out-of-round. When polished stock is being cut, company furnishes a cast-iron bushing that fits into an inner tube so that the stock never touches the collet. In certain cases a cast-iron inner sleeve is used at rear of the guide bushing to prevent scratches. Collets are said to last as long as those made of hardened steel.

Modern Machine Tool Co, 2005 Losey St, Jackson, Mich

Portable Hydraulic Cutter Serves Several Cold-Heading Machines

Dolly mounting makes for a completely portable unit, including motor, pump, oil reservoir, and cutting head suspended on a spring tension balancer. Guillotine cutter has clearance for 42-in.-dia coils and can be operated with finger-tip control to any position down to floor level. Unit illustrated has capacity for cutting 1-in. high-carbon steel in 1¼ sec; other cutting heads have capacities of ½ and 1¼ in.

Manco Mfg Co, Bradley, Ill

Tinnerman Offers New Automated Fastener Feeding Equipment

New line of fastener feeding equipment includes the Pneuma-Serve Model PS-5B. This machine accommodates screws with any type of pre-assembled washer—lock washers of internal tooth, external tooth, or spring type, as well as plain or spanner-type washers. Selective release mechanism accurately controls entry of fasteners into delivery tube. Oversize or mis-shapen screws are automatically trapped and then ejected by pressing rejector button that activates a pneumatic blow-out mechanism. New tools can feed screws of any type, including screws with unusual balance points with respect to head-to-shank ratios.

Geo A Tinnerman Corp, Box 2805, Cleveland 16, Ohio

ROCKWELL-BUILT

DELTA 11" metalworking lathe

"You can't beat it for precision work"

say Sam and Charles Lentini, Co-Owners, Jacy Manufacturing Co., Brooklyn, N.Y.

ACCURACY TO 0.0003 INCH. The Lentinis use their Delta 11" Lathe to machine precision instrument parts and components for the aeronautical and electronics industries where extremely close tolerances are demanded. Their Delta meets these exacting demands down to plus-minus 0.0003-inch tolerance. Sam Lentini points out that the lathe's L-00 tapered key drive chuck insures a positive grip on the work.

SHIFTS OPERATIONS QUICKLY. With their Delta 11" lathe, the shift from turning or boring to threading or tapping is done with complete ease. There's no time lost in changing set-ups. "The big, legible dials on the Delta lathe make precision machining fast and easy," explains Charles Lentini.

CONSISTENT QUALITY. Jacy men get the same high quality results in metals ranging from brass to titanium—in lots as large as 30,000 or small as 10. As Sam Lentini points out, "For doing precision work in small lots or large, you can't beat the Delta 11" metalworking lathe."

PAYS ITS OWN WAY. "In a shop like ours with a variety of work, every tool must be versatile enough to pay its way on every job," says Charles Lentini, "and *we have yet to find a precision job that our 11" Delta couldn't do.*"

SEE THE ENTIRE DELTA 11" METAL LATHE LINE. **Compare—and make up your own mind. Your Dealer is listed under "Tools" in the Yellow Pages of your phone book.**

Send coupon for all the facts!

DELTA ROCKWELL

another product by **ROCKWELL**

Delta Power Tool Division, Rockwell Manufacturing Co.
618H N. Lexington Ave., Pittsburgh 8, Pennsylvania

☐ Please send Delta Industrial Catalog on entire Delta 11" Metal Lathe Line.

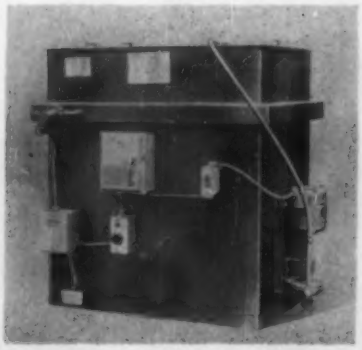
☐ Please send name of my nearest Delta Dealer.

Name_____ Title_____

Company_____

Address_____

City_____ County_____ State_____

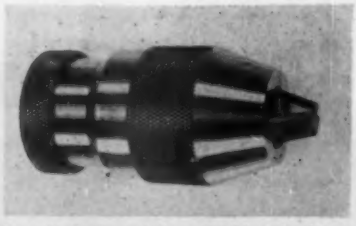


Vapor Degreaser Has Capacity of 600 to 900 lb of Steel per Hour

Improved Aircon Model 75 vapor degreaser is supplied as a complete unit, with low-level thermostat control and water flow interlock which prevents boil-out due to water supply failure. Unit is electrically fired on 220/440v and the electrical heater load is controlled by heavy-duty magnetic contactors.

Working area of 38 x 22 in. and a vapor depth of 24 in. allows a load cleaning capacity of 600 to 900 lb of steel per hr. Unit is suitable for trichlorethylene solvents, requiring 16 gal in boiling sump and 24 gal in storage. Water consumption is 30 gph. Degreaser, complete with ¼-hp motor, centrifugal pump, and manual spray lance, weighs 420 lb and sells for $625.

Armstrong & White, Inc, Aircon Div, 101 Freeport Rd, Cheswick, Penna



Swedish Precision Drill Chuck Tightens Automatically

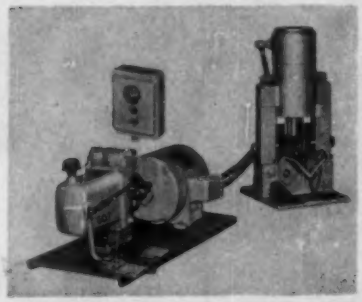
Drill chuck called Rapid tightens automatically, without key. There is no slipping or chewing up of the drill shank, and the ball-bearing construction makes opening extremely easy even after the heaviest of cuts. Device is available in several sizes: smallest has capacity of 0 to ¼ in.; largest, ⅛ to ⅝ in. Prices range from $12.80 to $18.

Distributed by Karl A Neise, 404 Fourth Ave, New York 16, NY

Alcoa Soldering Materials Cut Costs for Aluminum Fabricators

Two new high-temperature soldering materials, Solder No. 805 and Soldering Flux No. 66, are formulated for joining all aluminum alloys, and making joints between aluminum and other metals such as copper, brass, steel, stainless, and nickel. Solder has a melting range of 715 to 725 F, and works most effectively when preplaced in or near joint, rather than being fed manually. Flux can be applied dry or as a 70% flux —30% n-propyl alcohol solution, and can be removed after soldering operation by flushing with 180 F water.

Aluminum Co of America, 795 Alcoa Bldg, Pittsburgh 19, Penna



Hydraulically-Operated Machine Shears Angle Iron

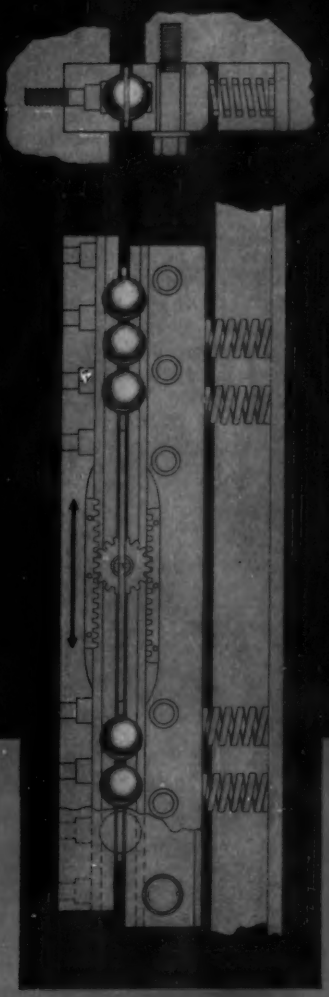
Angle iron shear is hydraulically operated and is controlled through a foot treadle and a 2-way selector valve. Blade is under complete control of operator at all times; it can be raised, lowered, or stopped at will. Using a 3-hp motor, machine has a cycle time of 6 sec. Side thrust blocks prevent misalignment of blade and die, or wear of cylinder.

Shear has a capacity of 4 x 4 x ¼-in. angle iron, ⅜ x 3½-in. flat, ⅝-in. round, ½-in. square bars, or 1-in. hollow square tubing with the regular angle-iron shear blade. There is no distortion of the bar ends. Additional blades are available to shear 5/16 x 6-in. flat stock, or bending dies to form right-angle bends in round, square, and flat stock up to ⅜ x 6 in. Dies and inserts are also available to shear various sizes of channel iron.

W A Whitney Mfg Co, 636 Race St, Rockford, Ill

FULLY HYDRAULIC FORGING MANIPULATOR (German) is built in standard sizes, ranging from carrying capacity of 5500 to 220,000 lb. Pressure pumps deliver water to accumulator at 1420 psi. From accumulator, pressure water is supplied to control center which, in turn, supplies pressure water as required to working cylinders. Movement of gripper, traveling, and opening and closing of jaws are all performed hydraulically—*Distributed by Kurt Orban Co, Inc, Industrial Equipment Div, Greenwich, Conn*

HOLLOWJET SPRAY NOZZLES, capacities from 1.5 to 1100 gpm, produce a spray with a 30° angle at 40-lb pressure. Furnished in pipe connection sizes from ¼ to 5 in. In brass, steel, and stainless. Data sheet 7120 —*Spraying Systems Co, Randolph St, Bellwood, Ill*



Only PRECISION Flexopress has Ball Bearing Ram Raceways†

4 sets of pre-loaded ball bearings on "C" and straight side presses (2 sets on smaller "C" types) completely eliminate lateral "float" of the ram. No lubrication clearance is required. Vertical accuracy is held within .0005" at any point of the stroke. Parallelism between ram face and bed is held to .0005" per foot.

Exclusive spring pre-load is self-adjusting, raceways are bolted securely in place after being located by springs.

the first major advance in press construction in 20 years

The extreme accuracy of the Flexopress ball bearing ram eliminates one of the main causes of die wear (punch striking the die). This means far more production between die grinds. High operating speeds are afforded by the light-weight high-strength construction of the anti-friction ram and the integral feed mechanism — in some cases, up to 600 strokes per minute! Even at these high speeds the Flexopress ram raceways run cool.

Get accuracy, high speed and longer die life for the life-time of your press. Specify Precision Flexopress, the only press with ball bearing ram raceways. Available in "C" types from 15 to 75 Tons, straight side from 30 to 300 Tons. Write today for literature.

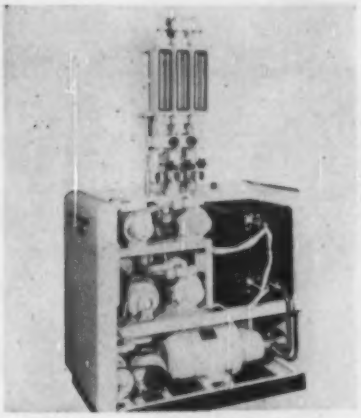
† patent applied for.

PRECISION®

3520 Iboen Avenue, Cincinnati 9, Ohio

PRECISION WELDER AND FLEXOPRESS CORPORATION

Builders of all types of Resistance Welders and Automatic High Speed Presses



Ultrasonic Emulsifier Produces Lubricants and Coolants

The Autosonic, one of a line of new emulsifiers, can be used to provide a continuous supply of cutting fluid for metalworking plants where demand is great enough to require use of an automatic processing machine. Basic principle makes use of the fluid-dynamic forces of the fluids themselves to produce the sound waves, instead of generating the ultrasonic energy outside the liquid. This is accomplished by impinging the liquids to be emulsified in a jet stream on the edge of a blade. Blade vibrates at its natural frequency (about 22,000 cps). Cavitation occurs continuously in the stream rushing past the blade. All energy is developed and used right in the liquids.

This unit, shown here without cover, has a variable output between 100 and 250 gph, and will automatically adjust itself to the quantity being drawn off. Oil, water, and emulsificant are pumped separately into unit through three control valves and flow rate indicators in order to adjust proportions in final emulsion. Float switches maintain balance in reservoir by controlling feed and discharge pumps as well as emulsifying unit.

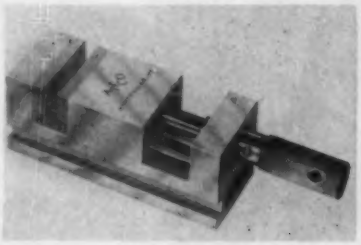
Sonic Engineering Corp, 146 Selleck St, Stamford, Conn

Molding Replaces Etching in Production of Printed Circuits

New process eliminates the etching procedure in the production of printed circuits. Process is based on the use of a phenolic impregnated cellulose sheet material which can be cured and formed into three dimensional shapes. Hole concentration reportedly can be twice that of punched XXXP parts and can be molded at lower costs and with less difficulty. Molding also allows holes to be tapered or stepped in depth. In addition, the technique forms a resin skin seal over all edges and hole walls, significantly reducing moisture absorption.

Several processes have been adapted for producing the circuits. A die stamping process presses an adhesive-backed continuous copper strip into the molding board. Since board serves as cutting edge and female die, tooling cost is reduced. This new production process is licensed by Rogers.

Rogers Corp, Rogers, Conn



Toolmaker's Vise Is Precision Ground on All External Surfaces

All parts on new toolmaker's vise, with exception of a totally enclosed leadscrew, are hardened; all external surfaces are ground to an accuracy of 0.0004 in. per in. Groove around base provides means of clamping vise to machine tables; dovetailed slide, adjustable for wear, gives rigidity and parallel location of jaws at all times.

Vise is available in three models: smallest has jaw width of 1¼ in., depth of 7/16 in., jaw opening of 1 in., and weighs 1¼ lb; largest size has jaw width of 2½ in., and in-between model 1⅞ in.—other dimensions being in proportion. Prices start at $24.50.

Air Transport Equipment, Inc, Amityville, LI, NY

Plastic Surface Plate Has Low Initial Cost, High Trade-in

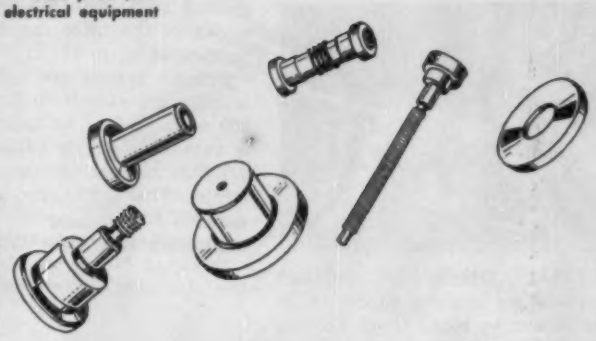
Fine grain granite-in-the-rough is coated with special Ren plastic developed to give a smooth hard surface on surface plates which are reported to be accurate within 0.002 TIR of a true plane across corners. The plates are qualified for precision work and are well within the required tolerances for steel tools, wood models, patterns, and plastic tooling. Company claims savings in initial costs up to 50%. If plate needs repair or resurfacing the user orders a new plate and upon arrival the old plate is returned for a generous trade-in allowance. Minor repairs are easy with Ren Plastic material.

Plates come in eight standard sizes from 24 x 60 in. to 72 x 96 in. with 2, 4, or no ledges. Thicknesses are 6, 8, 10, and 12 in.

Renauld Plastics, Inc, 5422 S Cedar Rd, Lansing 17, Mich

UNIVERSAL JOINT SPIDERS are ground on all four trunnion ends in one setup on this Model 2H30 30-in. double spindle precision disk grinder. Two parallel ends are ground at a time, then spider is automatically indexed 90° and second pair of ends are ground. Max over-all stock removal is 0.015 in.; production is 2400 pieces per hr at 100% efficiency—*Gardiner Machine Co, Beloit, Wis*

9" Model A Bench Lathe—
base price $444
less electrical equipment



BETTER PRECISION PARTS AT LOWER COSTS

Keeping up the required production of small precision parts, while holding down costs, can be a tough problem. Many manufacturers have successfully turned to South Bend 9" and Light Ten Bench Lathes for they are made for this kind of work. Accurate, smooth, economical, easy to operate—and they're ultra dependable. Tolerances need not be sacrificed for output. Exceptionally large selection of attachments available to facilitate tooling. Send coupon for complete information.

Light Ten Toolroom Bench Lathe—base price $765 less electrical equipment

SOUTH BEND

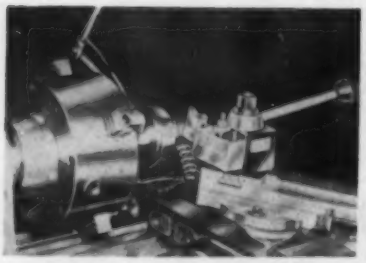
SOUTH BEND Lathe, South Bend 22, Indiana

Send literature on _____ 9" Lathes, _____ Light Ten Lathes, _____ Engine and Toolroom Lathes, _____ Turret Lathes, _____ Milling Machines, _____ Shapers, _____ Drill Presses, _____ Pedestal Grinders.

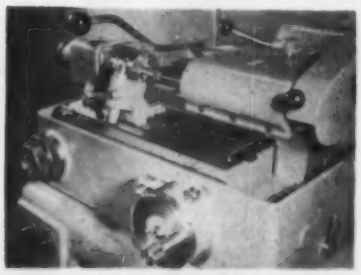
Name _____

Company _____

Street _____ City and State _____



UNIVERSAL THREADING HOLDER comes with an interchangeable, high-speed threading blade which has two cutting edges. Operator can reverse lathe and cut a thread without fear of hitting shoulders. Literature available —*Aloris Tool Co, 131-37 Sanford Ave, Flushing 55, NY*

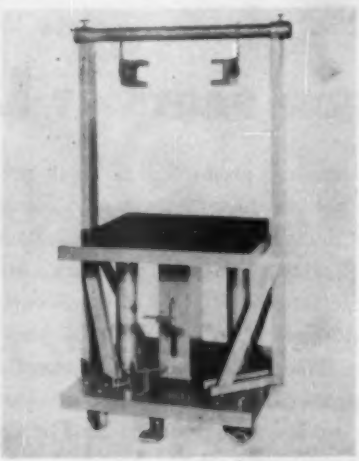


Cylindrical Grinder Features Spindle Speeds Up to 120,000 rpm

Overbeck cylindrical grinder, a German product, is suitable for external and internal grinding of all types on components. Capacity ranges from the smallest diameter to a max grinding length of 4¾ in. Largest size piece which can be conveniently ground is 1 3/16-in. dia. Longitudinal stroke of the table can be adjusted from 0.004 in. to 4¾ in.

Spindle speeds are selected electrically and vary from 30,000 to 120,000 rpm. Infeed of grinding wheel is automatic and is adjustable from 0.00002 in. per stroke or double stroke. This mechanism is said to be entirely free of play and can be set accurately to within 0.00002 in.

Imported by Aaron Machinery Co, Inc, 45 Crosby St, New York 12, NY



Die Separator Attaches Easily To Lexco Lift Tables

Demountable die separator is quickly and easily mounted to the base of company's lift tables with just four bolts. Crossbar of rolled steel tube is equipped with two clamps which are movable on the crossbar enabling adjustments to fit any width die-set. Clamps can hold 2000 lb.

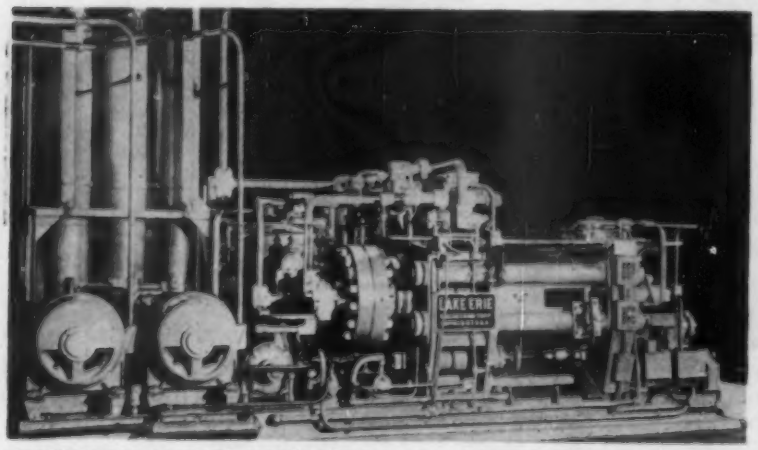
When mounted on lift table, die separator has a height of 62 in. from floor to bottom of crossbar, a width of 30¾ in., and a table clearance of 14 in. when table is raised to its highest position.

Lexco Engineering & Mfg Corp, Dept DS, PO Box 161, Colmar, Penna

Cooling System Sprays Atomized Coolant Particles at Cutting Point

Spray-Cooler, a lowcost portable cooling system, directs finely atomized particles of coolant to the point of cutting, and reportedly prolongs tool life from 50 to 500%. Unit operates on compressed air at any pressure from 50 to 125 psi. Compressed air, passing through a tube inclosed in a flexible hose, siphons coolant from 1¼-gal tank; coolant and air are mixed in proper ratio by adjusting two valves. Increased tool life is attributed to rapid heat removal. Heat is removed in four ways: heat is absorbed as coolant spray evaporates; expanding compressed air absorbs heat; heat is carried off by flow of air; and a fine film remains on the tool and work to cool and lubricate. Unit sells for $37.50.

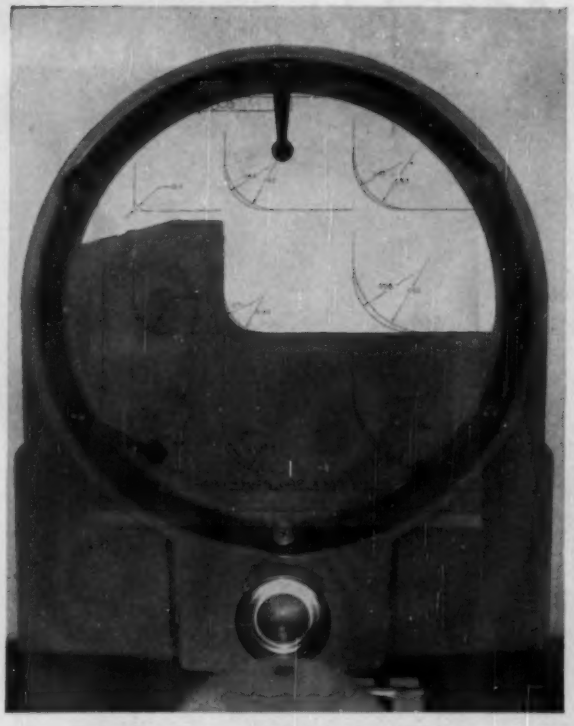
Triple-E Engineering Co, Racine, Wis



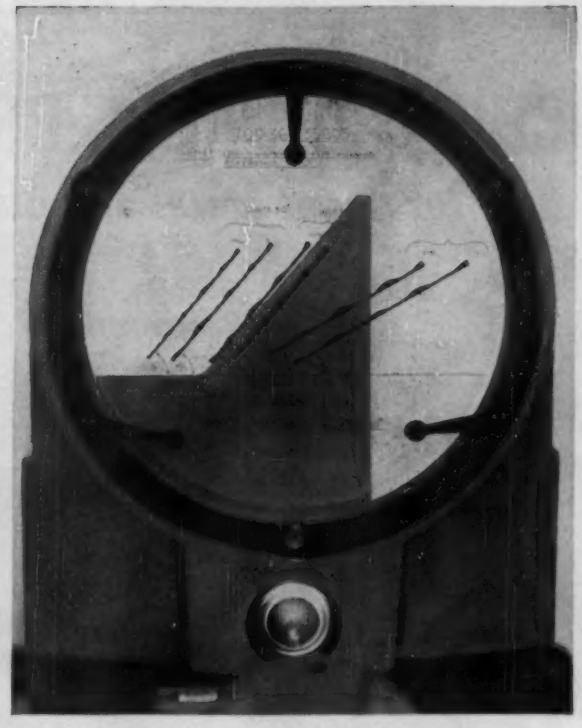
TORSION-BAR ANCHOR HOUSINGS for automobiles have been extruded from 1035 steel at a rate of 525 per hr in cold extrusion press which has a main ram stroke of 18 in. Approach speed is 1200 ipm; extrusion speed is 500 ipm at 2550 psi—*Lake Erie Machinery Corp, 507 Woodward Ave, Buffalo, NY*

Safety solvent, SS-25, is recommended for cleaning and degreasing motors, mechanical parts and equipment, and electronic components. It has no flash at the boiling point, is corrosion free, leaves no residue, and is said to be about 25 times safer than carbon tetrachloride. It can be applied by sprayer, brush, or wiping, and is packaged in 35 and 55-gal steel containers.

National Disinfectant Co, 8417 Commerce St, Dallas, Tex



1–A typical MS aircraft bolt has a radius tolerance of .031-.041 on the fillet where the head joins the shank. By placing up to 9 radius drawings on a single overlay chart, a number of machine operators can check fillets during production.



2–Another typical job at Standard Pressed Steel Company involves checking the angularity of a 100° flush head bolt to ½". Angularity is checked at the same time that the radius is measured to .0015" (limits are .016-.019).

How Kodak Contour Projectors help keep gage inventories low in production checking

Standard Pressed Steel Company—manufacturer of aircraft bolts, socket screws, and other close-tolerance fasteners—once needed as many as 26 radius gages to check the fillets of *each type of bolt* it made while the bolts were in production.

Multiply this figure by the number of types of fasteners . . . add the gages required for checking other dimensions such as root radii—and you get an idea of the vast inventories involved in conventional inspection methods.

Now SPS does much of its production inspection by optical means with Model 8 Kodak Contour Projectors—and gage inventories have been slashed for these 4 important reasons:

- Light in weight, the Model 8's can be readily moved, used where needed on the production line.
- A single Contour Projector can serve several machine operators, since one screen chart can show tolerance limits for as many as nine different radii. (Fig. 1)
- A single chart can check several dimensions at once on a given part. (Fig. 2)
- By interchanging charts, the same Projector can be used to check a variety of parts—bolts, flat-head screws, or socket screws. (Fig. 3)

Model 8 and other Kodak Contour Projectors can help simplify your measurement and inspection problems, too. For full details write for our illustrated booklet, "Projection Gaging with Kodak Contour Projectors," or ask for the name of the Kodak field representative in your area. He'll be glad to advise you.

3–Here an operator uses a Model 8 Projector to check the root radius of threads to tolerances on the order of .002".

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

Apparatus and Optical Division

the KODAK CONTOUR PROJECTOR

Kodak

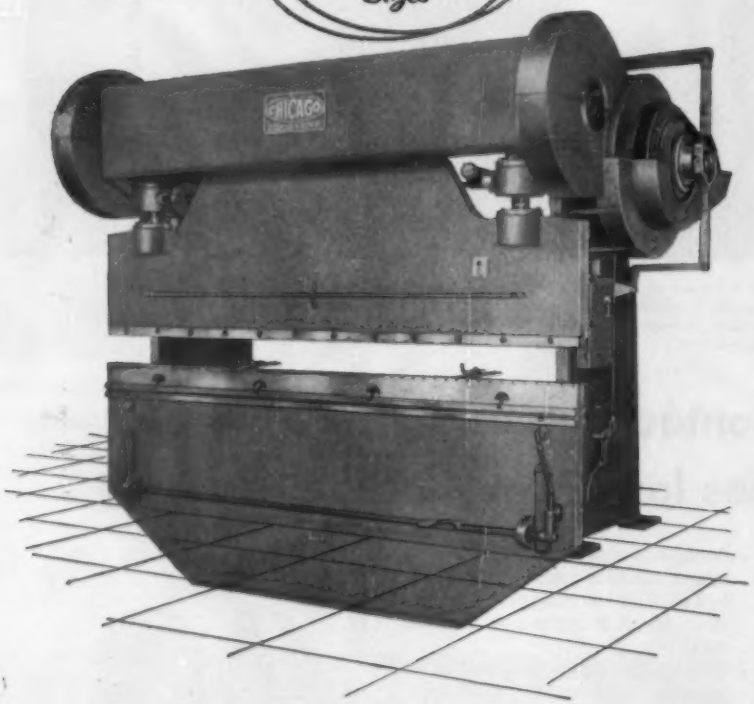
CHICAGO® PRESS BRAKES

for sheet metal and plates

Advanced Design

50 Standard Sizes

Capacities 11 to 450 tons



This is one of the Series D CHICAGO press brakes. It has a bending capacity of 10 feet by ¼ inch—150 tons. Over-all bending length is 12'-2".

Complete recommendations for any job on request.

6777

CHICAGO DREIS & KRUMP

Press Brakes • Straight-Side-Type Presses • Press Brake Dies

Hand and Power Bending Brakes • Special Metal-Forming Machines

DREIS & KRUMP MANUFACTURING CO.

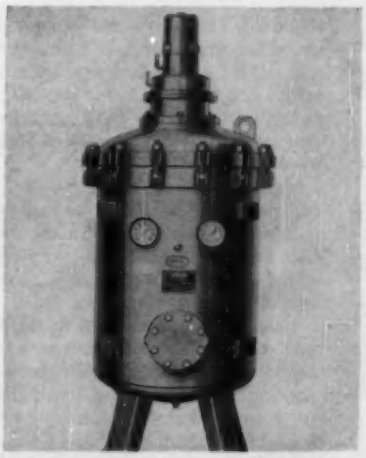
7434 South Loomis Boulevard, Chicago 36, Illinois

NEW SHOP EQUIPMENT

Electric Limit Contact Gages Are Accurate to Within 0.000020 in.

Electric comparator (German) has a signal light attachment that reports over- and under-size as well as correct size accurately within 20 millionths by flashing of green, red, or yellow lights. Unit is available with or without dial. Dial type permits observation of the position relative to tolerance limits on the dial in addition to the signal lights. There is a second socket in the light signal box, which can be used to install an audible signal or other indicating device. Prices start at $235. Bulletin available.

Distributed by George Scherr Co, Inc, 200 Lafayette St, New York 12, NY



Self-Cleaning Filter Handles Coolants or Lubricating Oils

Dual-purpose, fully automatic filter has interchangeable filter elements for handling lubricants or coolants. Filter media for lubricating oils is made of wire-wound stainless steel or bronze, wrapped around a cast-

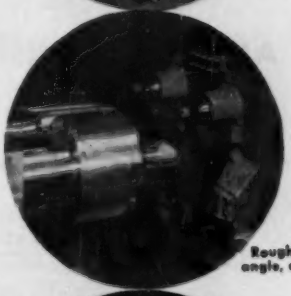
New OLOFSSON Special

Boosts Production of Rear Band Servos

This new OLOFSSON Special, Three Station, Two Way Precision Boring Machine performs multiple operations on rear band servos in the plant of a leading automobile manufacturer.

In the three stations shown at right, the machine rough bores, forms angle, grooves, and finish bores. Production is 220 pieces per hour.

STATION 1
Load and unload two parts.



STATION 2
Rough bore, form angle, and groove.

STATION 3
Finish bore.

For "*Profit-Making*" Special Machinery designed to lower *your* production costs, consult OLOFSSON. You'll find it pays! Phone IVanhoe 4-5381, or write . . .

THE OLOFSSON CORPORATION
2728 Lyons Avenue Lansing, Michigan

Manufacturers of **PRECISION BORING MACHINERY AND SPECIAL MACHINERY**

Stick to standards and save

You can save on engineering and manufacturing costs by building your *special* machines the same way Baker does — out of Baker's *standard* components. Build with standard hydraulic slides and power units . . . one of the Baker Basic models will fit 9 out of 10 applications. You save, and you actually get a better machine from Baker design-tested components.

BAKER

AUTOMATION

Best in the long run
Practical in the short run

CHECK AND MAIL FOR DATA

NAME AND TITLE

COMPANY

ADDRESS

CITY ZONE STATE

BAKER BROTHERS, INC.
Dept. AM-857, Toledo 10, Ohio

Send me prices and comprehensive 2-page data-spec-dimension sheets on these standard Baker components . . .

BAKER BASIC HYDRAULIC SLIDES

CHECK HERE	WIDTH OF-WAYS	CAPACITY HP MAX.
( )	11	5
( )	12	15
( )	18	15
( )	18	25
( )	20	50

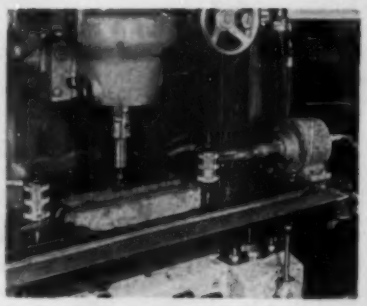
( ) Drive box for above slide
( ) Porta-Pak hydraulic power unit
( ) Standard index tables

NEW SHOP EQUIPMENT

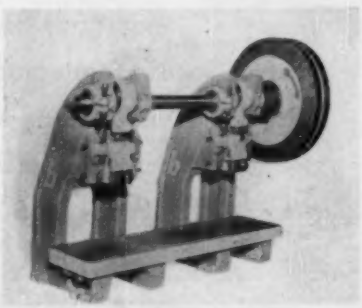
iron core, with a port opening range of 0.002 to 0.015 in. Coolant filter offers a porosity range of 0.020 to 0.045 in., utilizing a brass perforated sheet as filter media. Timer provides completely automatic self-cleaning cycles ranging from minimum of 20 sec to max of 30 min.

Extra-large sump permits exceptionally long filtration cycles. A wide range of sizes is available with flow rates ranging from 120 to 1200 gpm. Bulletin available.

Bowser, Inc, Lubrication and Filtration Div, 1300 E Creighton Ave, Fort Wayne, Ind

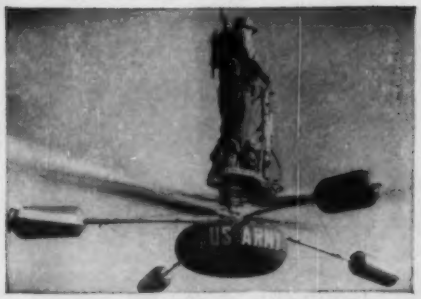


AUTOMATIC SETUP CLAMPS, designated PowRlock, can be installed on any standard machine, jig, or fixture, to replace nuts and bolts. Basic unit consists of an air control, hydraulic booster, and one of three models of clamping heads. Boosters come in three sizes, capable of operating one, two, or four heads. Recommended travel for locking piston is ⅛ in.— *Wilton Tool Mfg Co, Inc, 9525 Irving Park Rd, Schiller Park, Ill*



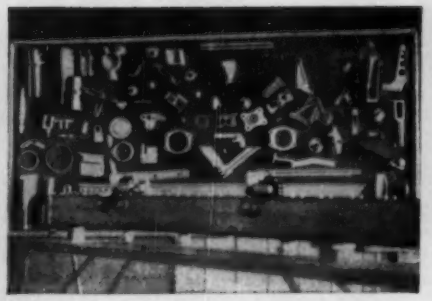
Multiple-Ram Benchmaster Serves As Small Press Brake

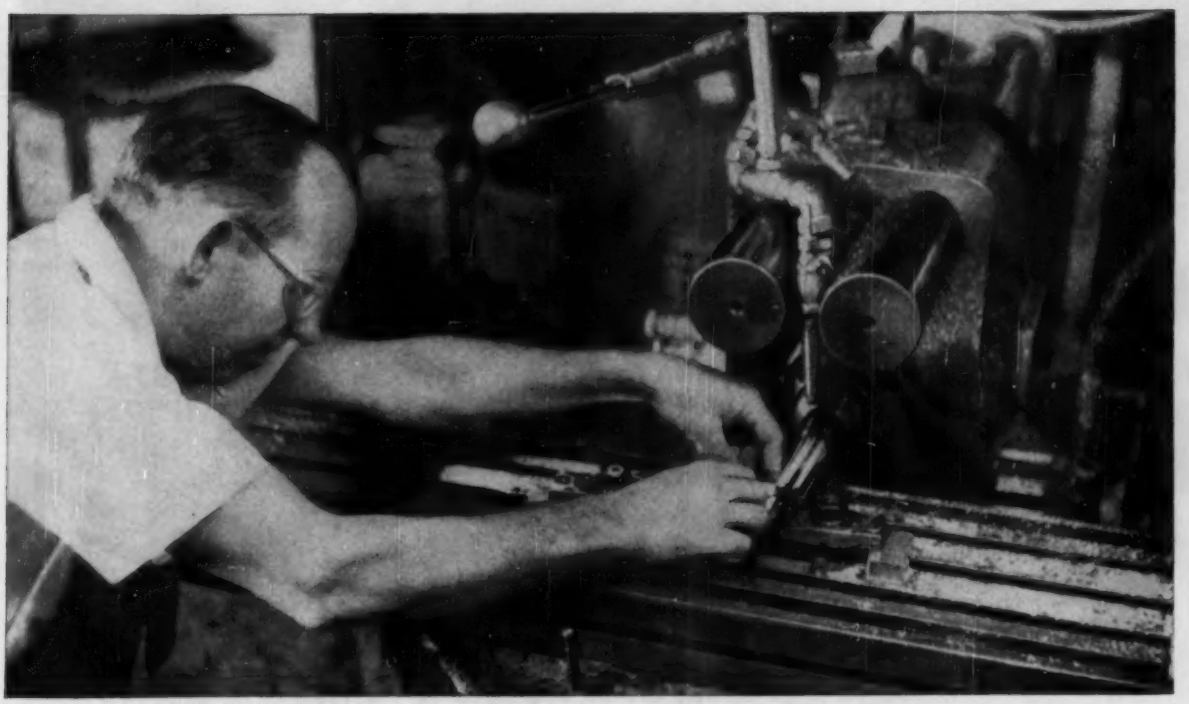
Two 5-ton fixed-bed gap-frame presses, operating in tandem from a single crankshaft common to both presses, perform the functions of a small press brake at considerable



◀ **Aerocycle,** a one-man helicopter now being tested by the U. S. Army, is one of the many aircraft for which Aeroaffiliates machines precision parts.

Some Examples of Aeroaffiliates' Work. ▶ All require fine tolerances and excellent finish. All were made with the help of Cities Service Chillo Cutting Oils.





"Fine Tolerances! Excellent Tool Life! With Cities Service Chillo Cutting Oil"

In probably no other machining operation are the tolerances so fine, the requirements so demanding as in aircraft work . . . especially when it's for the U. S. Army or Air Force.

But it is on such work that Aeroaffiliates, Inc. of Fort Worth, Texas, has become famous.

Every day, Aeroaffiliates employees must work with tolerances as fine as .0001, and their products must have an unusually good finish . . . so good that they are measured by a special gauge before the aircraft industry will accept them.

Obviously, this could play havoc with tool life . . . "but thanks to Cities Service Chillo Cutting Oils, tool life and finish are the best ever," says Aeroaffiliates. "These cutting oils are equalled only by the help we receive from the Cities Service Lubrication Engineer, a man whose knowledge and help we greatly value."

Whatever *your* type of machining operation, there's a Cities Service cutting oil tailored precisely for it . . . and a Cities Service Lubrication Engineer to help you choose it. Call him in this week. Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

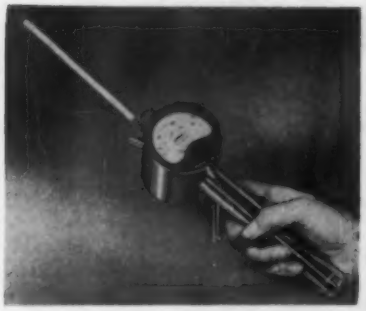
CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

savings in cost. The presses are separated by 18½ in. between ram centerlines and are held in alignment by a single bolster plate measuring 37 in. long x 8 in. wide and 1½ in. thick. Crank has stroke of 1⅛ in. and operates at 230 spm.

Benchmaster Mfg Co, 1835 W Rosecrans, Gardena, Calif

WIRE - TRIMMING MACHINE gives clean cutoff and operates at 450 spm as operator guides wire products, such as trays, baskets, fan guards, and cages along the cutting die. Machine comes with ¾-hp motor and has a max capacity of 5/16-in.-dia wire—*Artys Sales Co, 11 Broadway, New York 4, NY*



Lowcost Surface Pyrometer Checks Surfaces as Small as ¼ in.

Pyrometer affords easy, quick method of obtaining accurate (2% over entire scale) temperature of surfaces normally difficult to check without expensive equipment.

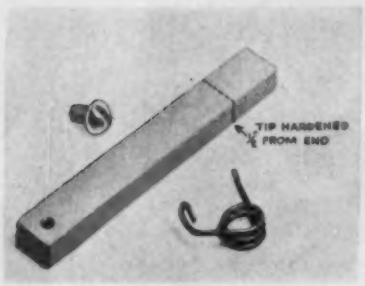
Calibrating thermometer, built into the 1½-lb instrument, is positioned in the immediate vicinity of the cold junction, providing a more accurate means of cold junction calibration. Replaceable thermocouple, approximately 12 in. long, is insulated with refractory beads.

Model 321SL-IC has range of 50-650 F; Model 321S-IC, 0-1600 F; Model 321S-CA, 0-2300 F. Price is $64.50.

Pacific Transducer Corp, 11836 W Pico Blvd, Los Angeles 64, Calif

Scriber, the Slim-Line Micro-Scriber, is designed for close and fine scribing on all metals as well as plastics, ceramics, and glass. Tip of the pencil-shaped tool is made of an alloy consisting of 95% tungsten carbide and 5% cobalt, and is ground and lapped. Scribers are priced at $1 and are shipped 24 to a carton.

Greist Mfg Co, New Haven 15, Conn



DIE STOP, Keystone Primary, has prehardened tip and is so simple to install that apprentice can handle job. No precision holes have to be drilled in accurate locations, actuating spring serves as a retainer for movement in both directions—*Keystone Engineering & Mfg Co, 122 S W 16 St, Des Moines, Iowa*

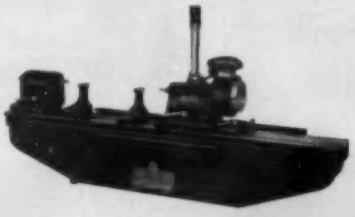
Free-Wheeling Attachment Provides Action in Either Direction

Rotahead No. 5448 replaces reversible ratchets by making any ½-in. handle, attachment, extension, or torquer instantly reversible.

To change direction, head is pressed down; when released, 30

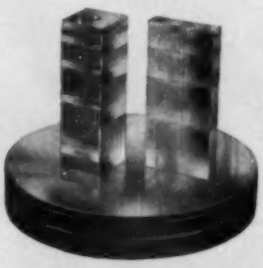
(Advertisement)

Basic Equipment for Higher Precision

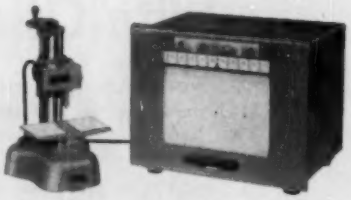


P & W STANDARD MEASURING MACHINE

. . . is used throughout industry to measure gages, tools and finished products for diameter, length, roundness, straightness, parallelism and taper direct to .00001" with controlled measuring pressure.

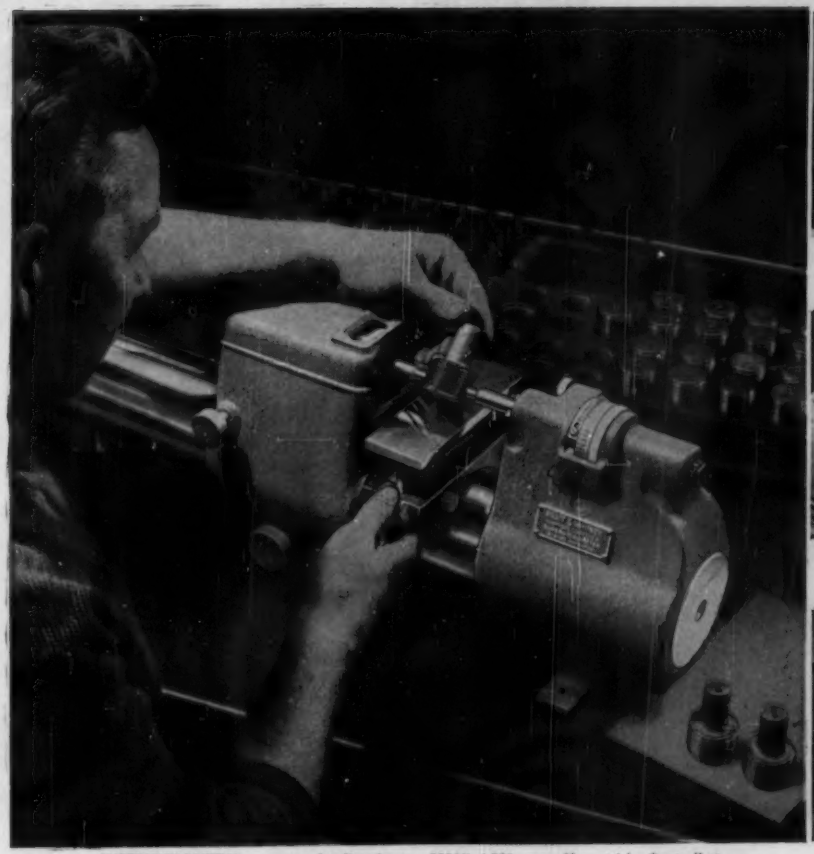


P & W PRECISION GAGE BLOCKS . . . are the basic standards of precision in thousands of plants. Guaranteed for size, parallelism and flatness within a few millionths of an inch. HOKE Blocks (square type) and USA Blocks (rectangular type) are available in steel or solid carbide.

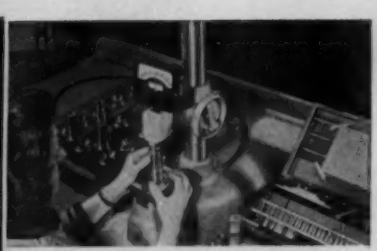


P & W ELECTROLIMIT MILLIONTH COMPARATOR

. . . was developed by Pratt & Whitney for checking Precision Gage Blocks to a millionth of an inch. An essential item of basic measuring equipment for every plant that must establish and maintain truly high master standards of accuracy.



SUPERMICROMETER . . . reads directly to .0001" (.001 mm, if metric). Controlled measuring pressure eliminates operator's errors. Ideal for daily use at machine or on inspection bench.



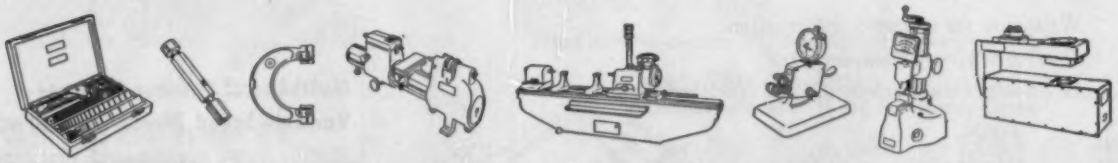
ELECTROLIMIT COMPARATORS . . . for the ultimate in gaging accuracy. Magnifications up to 110,000 times insure accurate indication of smallest errors.

AIR-O-LIMIT COMPARATORS . . . are extremely versatile, check a wide range of products. Readily engineered to your specific requirements.

ELECTROLIMIT SUPERMICROMETER . . . reads direct to .0002". Used as a comparator, it tells operator at a glance exactly how much a part is over or under the required dimension.

Improve Your Quality and Reduce Your Inspection Costs

PRATT & WHITNEY GAGES AND COMPARATORS . . . are available for practically every need and every product. In this complete line, you will find the right gage for use at the machine, on the bench or in the inspection room. You will find that these P&W Gages and Comparators make it possible for you to establish and maintain higher, more dependable standards of product precision and quality and — in addition — will help you reduce your inspection time and costs to a minimum. Write now for complete information, outlining your quality control needs. Pratt & Whitney Company, Incorporated, 11 Charter Oak Boulevard, West Hartford, Conn.



GAGE BLOCKS . . . CONVENTIONAL GAGES . . . SUPERMICROMETERS . . . STANDARD MEASURING MACHINES . . . COMPARATORS . . . AUTOMATION AND CONTINUOUS GAGES

PRATT & WHITNEY

FIRST CHOICE FOR ACCURACY

MACHINE TOOLS • GAGES • CUTTING TOOLS

Cost Less in the Long Run . . .

. . . because PRATT & WHITNEY KELLER CUTTERS produce *more* accurately machined pieces per tool and run longer between grinds. The result is lower *tooling costs* than with other cutting tools which may cost less initially, but produce less. Correctly designed, precision manufactured from selected steels and inspected to meet rigidly high P&W standards, they are *quality* from start to finish! Now produced in both straight and taper shank types in a wide range of lengths and diameters. Available from stock at the P&W Branch Office near you.

Write now for complete information.

Pratt & Whitney Company, Inc.,
11 Charter Oak Boulevard, West Hartford, Conn.

. . . THREAD ROLLING DIES • DUOCONE DIES • TAPS • THREAD MILLING CUTTERS • REAMERS . .

PRATT & WHITNEY
FIRST CHOICE FOR ACCURACY
MACHINE TOOLS • GAGES • CUTTING TOOLS

teeth engage for heavy torquing capacity. New bite is possible every 12 degrees, and attachment can be reversed at will. Head is 1-1/16 in. for use in restricted areas. Unit is made of Protoloy steel.

Proto Tool Co. 2209 S Santa Fe Ave, Los Angeles, Calif

Dial-Indicator Snap Gage Features Retractable Anvil

New gage has a retractable anvil that permits faster operation, resulting in more pieces checked per hr. Because gage is portable, it can be used to inspect work right at machine as well as in toolroom. Illustration shows gage being used to check rolled spline on an axle shaft; master setting gage is shown in snap gage. Gage is available in size ranges from ¼ to 5 in., with carbide anvils furnished to suit individual requirements.

Lincoln Park Industries, Lincoln Park 25, Mich

Multi-Barrel Finisher Features Variable-Speed Direct Gear Drive

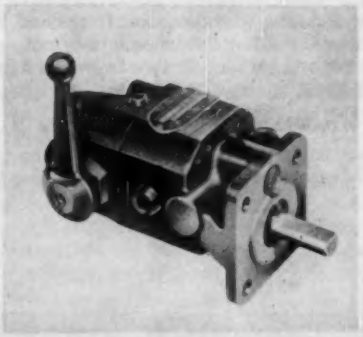
Model V-16 multi-barrel finishing unit, designed as a heavy-duty unit for tumbling, burnishing, and deburring of flat washers, screw-machine parts, die castings, jet blades, threaded bolts, and similar parts, features a variable-speed direct gear drive. This eliminates need for chains and sprockets and permits simple

speed adjustments from 8 to 25 rpm.

Machine measures 82 x 42 x 64 in. high and has 30-in. clearance under barrels. Other features include 16-cu-ft capacity, choice of 1 to 4-compartment barrels, seamless vinyl linings, 3-hp motor, forward and reverse jogging switches, and all-welded ¼-in. steel plate construction.

Rampe Mfg Co, 14915 Woodworth Ave, Cleveland 10, Ohio

MAGNIFIER, called Precision Vision, is a double-lens, 5-power device which is highly corrected for spherical abberation. Two optically ground and polished lenses are hermetically sealed in a lightweight aluminum case. Overall size is 2⅛-in. dia by ¾ in. thick. Swivel clamp and stand are particularly useful for shop applications— *S B Logan & Co, 134 Mill St, Genoa City, Wis*



Controlled-Flow Pumps Are Available With Flows up to 6 gpm

Lowcost pump reportedly gives performance closely matching that of a high-priced displacement unit. Pump is supplied with a speed control valve which can handle, at wide-open position, max capacity of pump.

(Continued on page 190)

. . . *because they Run Longer!*

. . . PRATT & WHITNEY END MILLS give you the lowest tooling cost for every finished workpiece. Correctly designed, carefully manufactured from selected steels, expertly heat treated, precision ground and rigidly inspected, Pratt & Whitney End Mills have *everything* it takes to produce finer finishes in less time and at lower costs. A complete line of types and sizes for every job requirement is available from stock at the P&W Branch Office near you.

Send now for completely descriptive literature.

Pratt & Whitney Company, Inc.,
11 Charter Oak Boulevard, West Hartford, Conn.

. . . MILLING CUTTERS • CUT-OFF BLADES • END MILLS • KELLER CUTTERS • KELLERFLEX BURS . .

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FIRST CHOICE FOR ACCURACY
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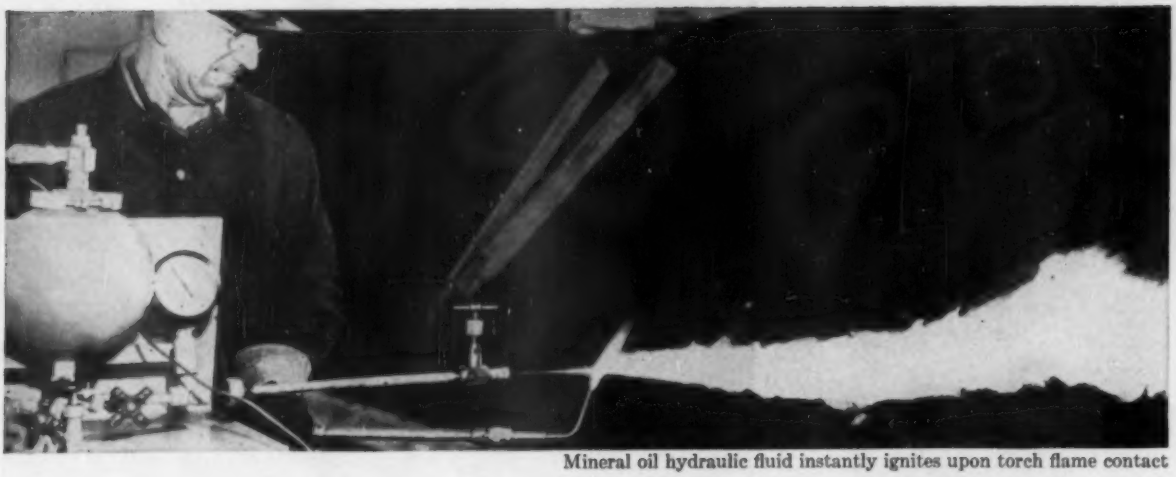


Mineral oil hydraulic fluid instantly ignites upon torch flame contact

Fire resistance plus low cost

FOR MANY YEARS frequent industrial fires involving hydraulic fluids have taken their toll in man-hours and high costs. This has created a widespread need for a relatively inexpensive all-purpose, fire-resistant hydraulic fluid.

In undertaking this challenge, Shell Research Laboratories spent over four years in laboratory and field testing before a solution was reached. The result was the introduction of Irus* Fluid 902 . . . the first low-cost, oil-base fluid that, under plant conditions, actually snuffs out fire.

The new formulation is a specific combination of petroleum oils mixed with water and emulsifying agents. It gains its fire resistance through a relatively high water content. Irus Fluid is perfectly adapted to the majority of hydraulic systems. The following is typical of many reports in Shell files.

Typical Problem and Solution

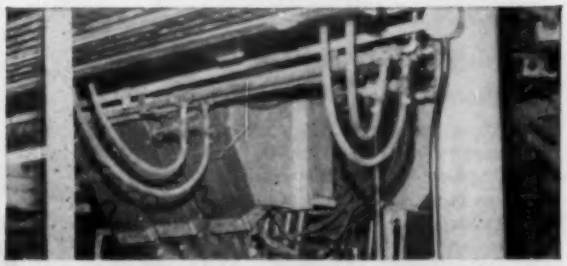
The welding plant of a prominent automotive manufacturer employing 100 hydraulically operated electric welders formerly used a straight mineral oil fluid. On one occasion, damaged fluid lines allowed this mineral oil under high pressure to spray directly onto the welding area. Sparks ignited the fluid . . . caused an immediate flash fire which resulted in 75% machinery damage before it was extinguished. Immediately following this incident, the changeover was made to Shell Irus Fluid 902. Shortly thereafter a line broke and the high-pressure spray once more contacted welding sparks. There was no fire at all . . . and in a matter of minutes the machinery was operating at full efficiency.

The two photos above provide dramatic proof of its flame resistance. In the photo on the left, conventional hydraulic fluid instantly ignites upon contact with an oxy-acetylene torch flame, whereas Shell Irus Fluid 902 (right photo), under the same conditions, does not support combustion beyond an inch or two from the flame. *Under plant conditions, it actually snuffs out fire!*

Two-Way Economy

An advantage not to be overlooked is the low cost of Irus Fluid 902. Many plant operators now making the

A leak is quickly spotted because of Irus Fluid's distinctive yellow color.



The complexity of cable lines necessitates the use of a fire-resistant hydraulic fluid to eliminate fire hazard.

Under the same conditions, Shell Irus Fluid 902 clearly demonstrates its fire resistance

in a new hydraulic fluid

switch to Irus Fluid find that it costs up to one-third less than other fire-resistant fluids—and its performance is comparable in every practical respect. This money-saving advantage is a vital consideration not only in the initial purchase price, but in reducing make-up loss expense.

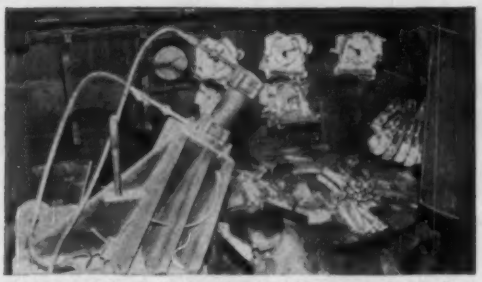
Irus Fluid 902 has other features, too:

1. **It contains no corrosive ingredients and has shown no harmful effects on normal seals, fittings, or bearings . . . it will not promote rust.**
2. **No major equipment modification is necessary . . . simply clean your present fluid thoroughly from the system and replace with Irus Fluid.**
3. **Practical application proves it has exceptional viscosity and lubricating qualities . . . doesn't thin out in use.**
4. **The yellow color of Irus Fluid enables you to spot and trace leaks easily . . . a valuable benefit in preventive maintenance.**

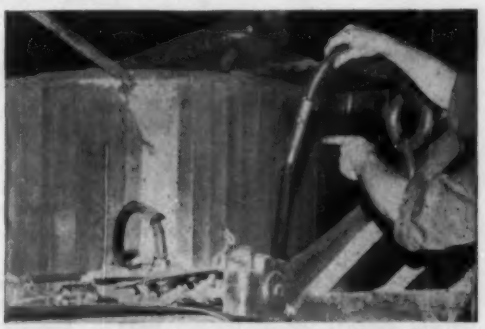
If your operation utilizes die-casting machines, plastic molding machines, glass blowing machines, permanent mold machines or any other hydraulic equipment where fire hazards are of concern, we suggest you investigate the advantages of Shell Irus Fluid 902.

Write or call the Shell Oil Company office nearest you.

*Trademark



Such specialized die-casting machines require a fire-resistant hydraulic fluid to assure maximum safety.



Finger points to line break in hydraulic cable that caused flash fire and machinery damage while operating with mineral oil type fluid.

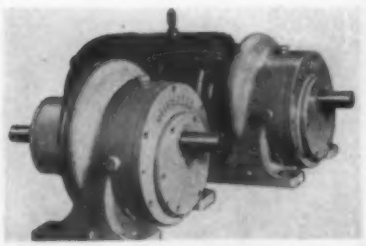
SHELL OIL COMPANY

50 WEST 50TH STREET, NEW YORK 20, NEW YORK
100 BUSH STREET, SAN FRANCISCO 6, CALIFORNIA

SHELL

Pumps are available in flow ranges of 0-1, 0-2, 0-4, and 0-6 gpm. Applications include controlled flow for traversing table of small grinder; controlled flow for lubricating systems; and flow control in reciprocating cylinders.
John S Barnes Corp, Rockford, Ill

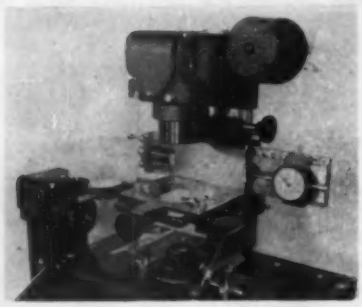
SAND-BLASTING MACHINE, Model B6 portable Jet-Blaster, has 650-lb capacity, handles conventional abrasive materials, and has adjustable flow control. Nozzle for wet sand-blasting, and remote controls are available at additional cost—*Air Placement Co, 1009 W 24 St, Kansas City, Mo*



PARALLEL SHAFT REDUCERS in ½ to 20 hp and in 12 ratios are available without motors. Design permits input shaft to be driven by coupling, chain, or V-belt drive, thus resulting in increased variations in output speeds. Extremely quiet in operation, units are designed to carry normal overhung loads on the output shaft—*Rockwood Pulley Mfg Co, Inc, 20 Crosby St, New York 13, NY*

Polyester resin, Hetron 33, is a medium-viscosity, semi-rigid type polyester recommended for use where good impact strength combined with high strengths is required. Material is said to be excellent for matched die molding. Laminates are strong, stiff, resist impact cracking, and are self-extinguishing. Data sheet 397 is available.
Hooker Electrochemical Co, Durez Plastics Div, North Tonawanda, NY

High-speed drills, designated Fastwist, are recommended for drilling aluminum, magnesium, copper, die-cast metals, some plastic materials, slate, and marble. Drills are available in taper shank sizes ⅛ to ¾ in., and in straight-shank taper-length wire gage sizes 1 to 60 and letter sizes A to Z.
Whitman & Barnes, 40600 Plymouth Rd, Plymouth, Mich



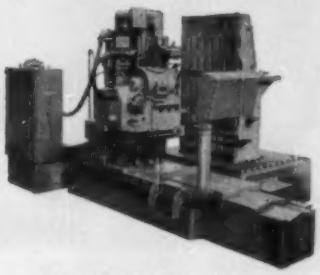
SURFACE ILLUMINATOR, for use on company's and other makes of optical comparators, consists of a lamp housing with high intensity lamp and lens system, and a pair of reflecting mirrors and brackets. Two mirrors are used in parallel; first mirror reflects light on the part, second returns beam —*Portman Instrument Co, Inc, Town Dock Rd, New Rochelle, NY*

Tracing paper and cloth, tradenamed Grid-X, are printed with non-reproducible cross-section guide lines. Paper is available in sheets, pads, and rolls; cloth is available in roll form only. Free samples are offered.
Charles Bruning Co, Inc, 4700 W Montrose St, Chicago 41, Ill

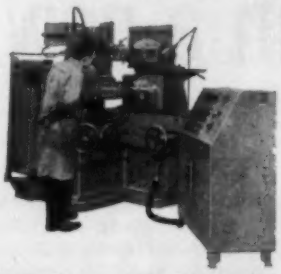
Vinyl enamel coating can be applied on machinery without interrupting work schedules—it is non-flammable during application and fire-resistant when dry. Material is available in seven colors, dries to the touch in 1 hr and is dust-free in 4 hr. It comes in 1, 5, and 55-gal containers. Bulletin LL-5662 available.
Wooster Finishes Corp, Wooster, Ohio

(Advertisement)

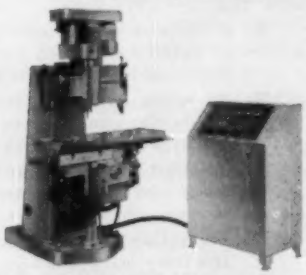
A P&W Tracer-Controlled
MILLER
FOR EVERY
JOB



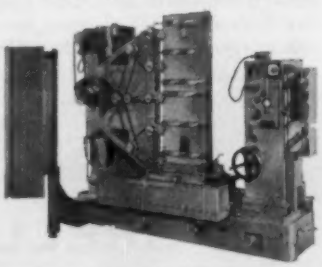
KELLER TYPE BG-21 . . . a powerful, versatile machine in a range of sizes from 5' x 2½' to 10' x 4', in single and 2-spindle models.



KELLER TYPE BL . . . a compact, powerful Tracer-Controlled Miller for work within the range of 36" x 20". With all new Keller features. Single and 3-spindle models.



VELVETRACE® MILLING MACHINE . . . duplicates the finest detail with extreme precision. New, non-contacting tracer control cannot damage the softest, most fragile 3-dimensional models.



AUTOMATIC DUPLICATION MACHINES . . . automatically reproduces original forging dies and glass or plastic molds with remarkable precision and detail. Two versions, one for molds, one for dies, with 1, 2 or 4 spindles

PHOTO COURTESY OF ALUMINUM COMPANY OF AMERICA

To machine the WORLD'S LARGEST DIE,

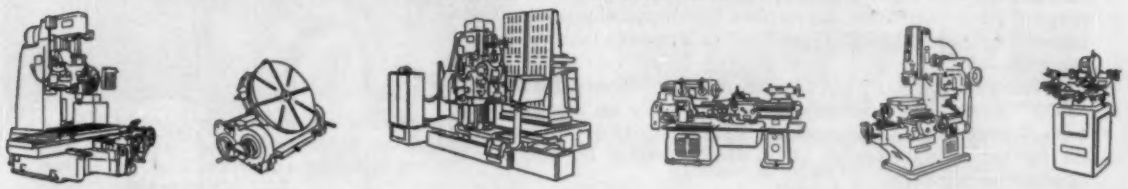
ALCOA chose the Keller . . .

. . . AUTOMATIC TRACER-CONTROLLED MILLING MACHINE

Consisting of two halves, each weighing 30 tons, this is the world's largest closed die block. Designed to forge aluminum backbones of fuselage and wing structures for the new multi-jet Martin SeaMaster, this giant die was produced on a P&W Keller BG-22 at the U.S. Air Force Heavy Press Plant operated by Aluminum Company of America.

Chances are that your own workpieces aren't as large as this die, but there is a Pratt & Whitney Keller Automatic Tracer-Controlled Miller for *every* worksize requirement. *Every* Keller Machine offers the same important advantages: fast, accurate reproduction of complex 3-dimensional shapes, extreme versatility and an overall ability to produce highest work quality economically. These advantages will also make Keller *your* first choice for a wide variety of die, mold and other hard-to-handle 2- and 3-dimensional milling jobs. Write now for complete information.

Pratt & Whitney Company, Incorporated, 11 Charter Oak Boulevard, West Hartford, Conn.



JIG BORERS . . . ROTARY TABLES . . . KELLER MACHINES . . . LATHES . . . VERTICAL SHAPERS . . . CUTTER AND RADIUS GRINDERS

PRATT & WHITNEY

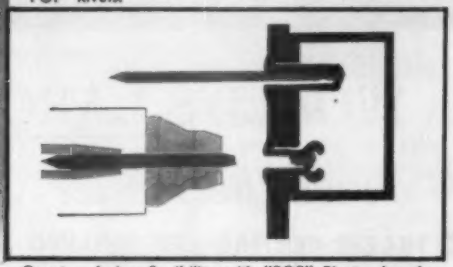
FIRST CHOICE FOR ACCURACY

MACHINE TOOLS • GAGES • CUTTING TOOLS

"POP"® RIVETS PULL PARTS TOGETHER...

High Clinch Action Exerts to 600 Pounds Squeeze

Flat sheets that must be pulled to a contour and fastened from one side no longer pose a fastening problem with "POP" Rivets.



Greater design flexibility with "POP" Rivets. An air-operated pulling tool weighing only 1 lb. 14 oz. sets up to 1200 per hour with unskilled labor.

For parts that must be pulled together and fastened from one side, you can't beat the high clinching action of "POP" Rivets. Particularly effective for riveting curved panels, moldings, and trim — as well as for many mechanical and electrical assemblies.

"POP" Rivets are a new concept in fastening convenience. They are inserted in the hole and a pulling tool draws the setting mandrel through the rivet until the mandrel breaks under tension. This gives you a tight, positive, vibration-proof grip over a wide range of stock variations. A complete line of portable pulling tools to meet the most difficult types of installations in factory or field is available.

Investigate the many advantages of "POP" Rivets. Remember, "POP" Rivets can probably save you money on *assembly costs* even if your present fasteners are FREE. Write or call us today for further information or plant demonstration by one of our application engineers.

"POP" RIVET DIVISION

UNITED SHOE MACHINERY CORPORATION

West Medway, Mass., KEystone 3-6611

Round Table...

PEACHES AND CREAM

Would a worker appreciate a birthday or "get well" card sent to his home by the company? Or would he be more inclined to look on such a thing as foolishness, and prefer to be remembered in a more practical way?

WHY SHOULD every supervisor and, in fact, nearly every employee look shocked when a company enters into the politics of playing hail fellow well met. We have seen organizations send flowers to fellow members who are on the sick list, or because of family bereavements, and cards to the family on birthdays. In fact most unions use this plan to keep a personal touch with their members.

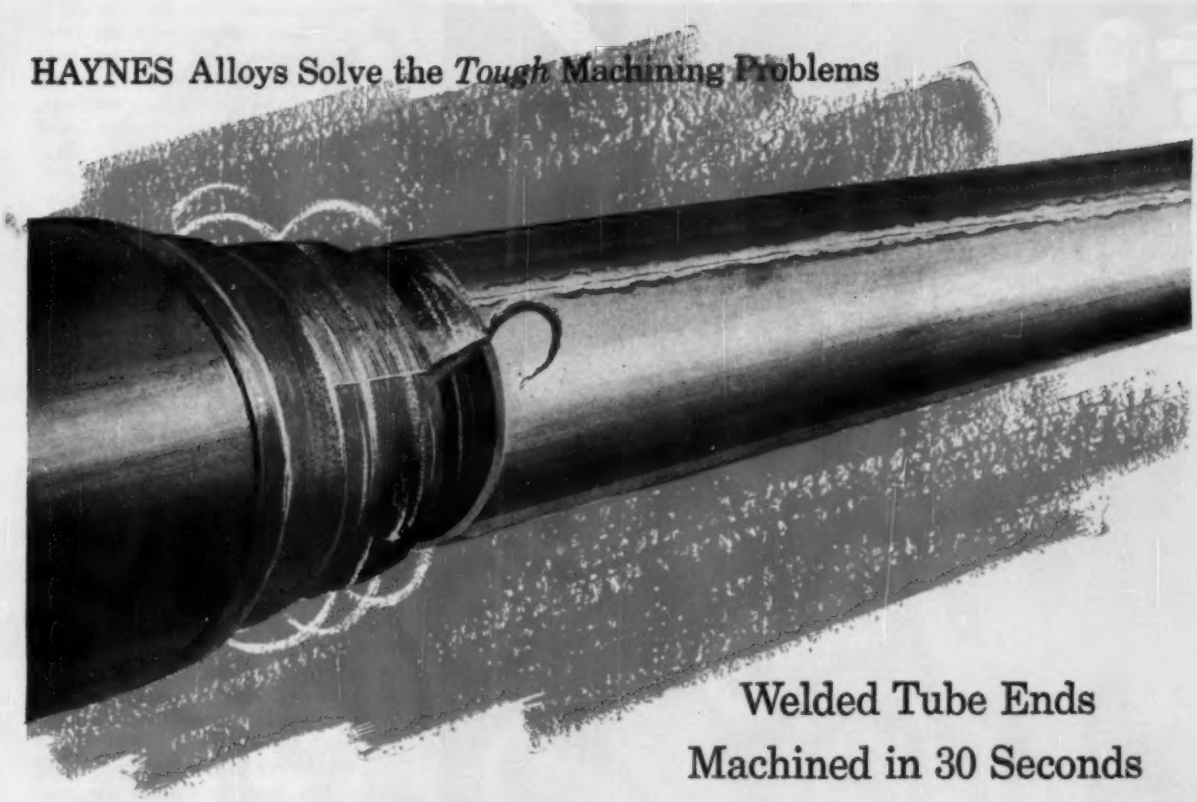
Why be so upset because a company has finally become smart? Perhaps they have suddenly learned that people working for them are not just numbers. Maybe they have discovered that their employees are human beings the same as the group of top officials.

True, it is quite a shock to suddenly receive birthday cards and flowers from a company, but certainly it is something that will serve to build goodwill. The only trouble is that it is not a general custom and we who work for companies always look on new ideas with a sinister consideration. We are always trying to find the angle of why a company has decided to do this or that.

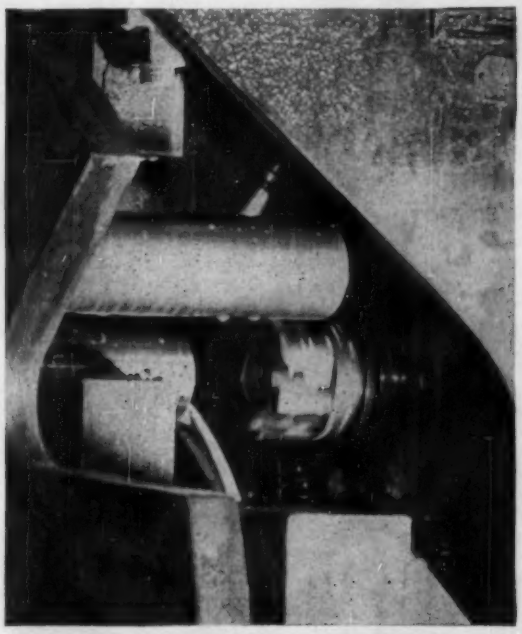
Perhaps our companies are not as hardboiled as they have been paint-

"First you say it's automatic and then you tell me I have to push buttons."

HAYNES Alloys Solve the *Tough* Machining Problems



Welded Tube Ends Machined in 30 Seconds



No down-time or interference with production while making an interrupted cut on thin welded tubing. 37 tubes are machined per hour in automatic set-up.

HAYNES STELLITE alloy tools are standard equipment on an automatic set-up for machining the ends of very thin, welded tubing. The tools are tough enough to operate for long periods of time under difficult machining conditions.

The tube ends are thin and tend to vibrate . . . the welded seam creates an interrupted cut on every revolution . . . and the cutting tool edge must remain sharp to make a clean cut without damaging the tube ends. Other tools tried on this application either mushroomed the tube ends, or failed by chipping. Only HAYNES STELLITE tools have handled the operation successfully in an automatic set-up.

For complete information on the unusual characteristics of HAYNES STELLITE Metal-Cutting tools, ask for our 16-page booklet. Write Haynes Stellite Company, Kokomo, Indiana.

HAYNES
ALLOYS

HAYNES STELLITE COMPANY
Division of Union Carbide Corporation
Kokomo, Indiana

UNION CARBIDE

"Haynes" and "Haynes Stellite" are registered trade-marks of Union Carbide Corporation.

Here's a simple, economical way to turn water into an *all-around* superior grinding solution for ferrous metals and titanium! For ferrous metals, just mix 1 part W&B Grinding Concentrate 1500 with 150 parts of water. You'll get a low-cost, transparent mix that really keeps wheels open . . . settles chips instantly. Provides excellent rust protection and freedom from foam too. Grinding is keener . . . machines stay cleaner. Get complete information on this outstanding grinding concentrate. Fill out and return attached coupon.

W&B Grinding Concentrate 1500 is being used by many of the country's largest manufacturers.

W+B INDUSTRIAL LUBRICANTS

THE WHITE & BAGLEY CO.

Worcester, Massachusetts • Detroit, Michigan

Originators of Grinding Lubricants

THE WHITE & BAGLEY CO., 90 Foster St., Worcester, Mass.

Please send me complete information on W&B Grinding Concentrate 1500 — and the list of large users.

Name ..... **Title** .....

Company ..... **Street** .....

City ..... **Zone** ..... **State** .....

☐ My plant has a tricky grinding problem on which we'd like advice. I've attached a letter describing it in detail. I understand that you offer this service without obligation.

ed, but because they have always felt that they should not enter into the battle of human relations and workers' equality, they have left the soft side of the approach to employment to others. The companies have felt in the past that they must stay aloof so that they would be looked up to. This has not necessarily worked out satisfactorily in all cases and many times they have lost good personnel due to the impartial feeling that they have taken in regard to the employee's needs, desires, and future.

The company should perhaps include with the birthday card a little incentive as a birthday gift. Even a few cents per hour increase in take-home pay might build a tremendous amount of goodwill. Since every employee would have a birthday sometime during the calendar year, the raise would be fair enough and might serve to beat the demand for wage increases. Why not try a plan that would automatically help hold employees and anticipate wage crises? A plan that would draw workers and one which places emphasis upon better relationship with all plant personnel.

More power to the company who takes the lead in making its employees part of the team and entering into the social aspect of remembering the nicer things in life. After all, we are today becoming so industrialized that we think only in terms of the dollar tag. We commercialize all the days which at one time had a meaning and served to draw the families closer together. If we lose the family relationship we will lose all our battles for a better way of life. So let's go along with

(Continued on page 197)

"Now, now, Chip. You wouldn't really quit here. You're just saying that to make me feel good."

draws 5½" deep in one SMOOTH OPERATION!

RODGERS PLATEN PRESS forms 220 tackle box bottoms per hour with a single draw 5½" deep and retains the leather-grained embossed pattern without distortions or fractures.

Rodgers smooth acting, 100 Ton Platen Press with high speed circuit for fast approach and return of platen. Has upper knock-outs as well as pneumatic die cushion. Provides accurate clamping pressures to insure smooth, even draws.

This strong, lightweight, rust-proof and moisture-proof aluminum tackle box would delight the heart of the most finicky salt or fresh water fisherman—it's the new Model 1000, in the line of famous quality tackle boxes made by the UMCO Corporation of Minneapolis, Minnesota—"Land of 10,000 Lakes".

A Rodgers 100 Ton Platen Press was chosen by UMCO to draw their boxes because of its extremely smooth action and efficient operation. The entire box is formed in three operations—the bottom, which is 18" long, 9" wide, is drawn 5½" in depth—the top is formed in one draw and cut apart to form the two top halves—the carrier band, of 18 gauge aluminum, is also formed in a single operation. Material used in both top and bottom is 18 gauge, leather-grained, embossed aluminum.

It requires a really smooth operating press to make these deep draws and still retain the original embossed pattern and turn out top quality production without fractures or scrap—reason enough that UMCO selected a Rodgers Press to do the job.

Rodgers Platen Presses are offered in capacities ranging from 50 to 500 tons. Write for more information to suit your operations.

Light, rust and moisture-proof aluminum tackle box having 53 plastic lined compartments, by UMCO; a proud addition to any fisherman's gear.

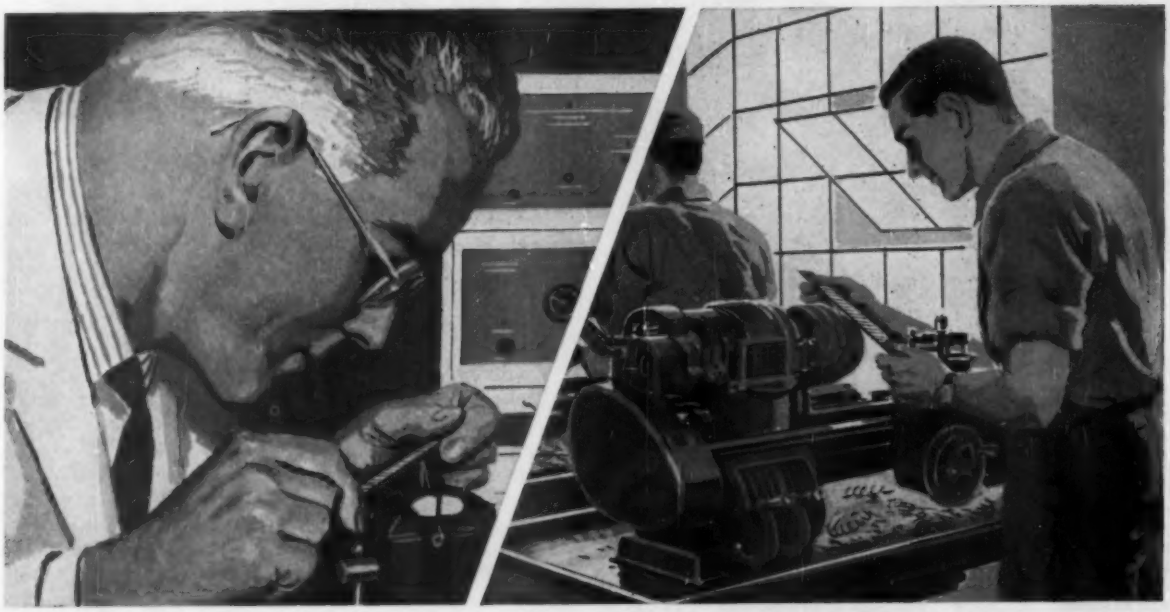
Trim, neat, tightly enclosed, Model 1000 UMCO tackle box, designed to put the lift at the bottom—where it belongs.

Rodgers Hydraulic Inc.

7407 Walker Street
Minneapolis 26,
Minnesota

HI-PRESSURE Rodgers HYDRAULICS

In laboratories...and in tooling



Filing problems of researchers building experimental apparatus are solved by one of 6000 different Nicholson or Black Diamond files.

Nicholson and Black Diamond files have uniformity of construction and stamina needed in high-speed tooling.

There's a Nicholson or Black Diamond file for every purpose

In laboratories where researchers explore for new products and methods, there's frequent need for files.

Working with a wide range of materials, often intricate shapes and many sizes, research men shape experimental apparatus and models of their projects.

Whatever the material or the filing problem, there is a Nicholson or Black Diamond file for the job. X.F. (*EX*tra *F*ine) Swiss Pattern files for fine work, Stainless Steel, Aluminum and Brass files for specific materials—files for fast cutting, for deburring, for finishing . . . for *every* filing job.

When an idea passes the development stage and goes into production, quality Nicholson-made files help workers file quickly and well. Combination of right file and filing method keeps costs down.

• • •

In laboratories, in tooling and on production lines, wherever you do filing, there's a Nicholson or Black Diamond file for the job. You can depend on 12 perfect files in every dozen. Available at your Industrial Distributor's, who maintains full stocks to give you fast delivery.

NICHOLSON FILE COMPANY, 29 ACORN ST., PROVIDENCE, RHODE ISLAND

(In Canada: Nicholson File Company of Canada Ltd., Port Hope, Ontario)

NICHOLSON and BLACK DIAMOND FILES

WORLD'S FOREMOST MANUFACTURER OF FILES FOR EVERY PURPOSE

any company who wants to return to the feeling that people are more than machines to be expended and thrown away. Human beings are strange creatures and far from being alike. We all react differently to a like situation but basically we all have the desire to be recognized in some manner, no matter how small this recognition is. The receipt of a card indicates the fact that someone has taken enough interest in you to take the time to look up your birthday and mail you the card.

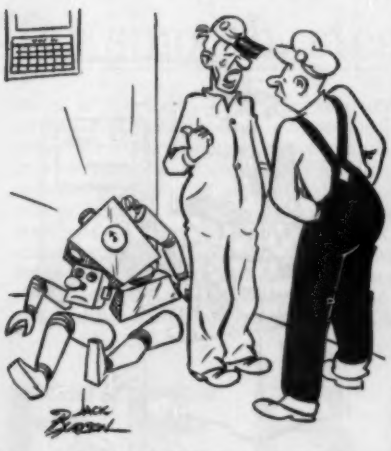
Charles D Townsend
West Hartford, Conn

PEACHES AND CREAM

A "HAPPY BIRTHDAY" card from his employer is a nice way to make an employee feel good. A greeting card is a personal reminder from the company that the employee is more than just a number on the payroll.

Speaking of birthday greetings, I know of one company that not only sends greeting cards to all male employees on their birthdays but also sends flowers to female employees and to wives of employees on their birthdays. It pays off in creating good feeling and better morale. I remember back in my apprentice days, on an employee's birthday, the boss used to go into the shop to say "happy birthday" personally and shake his hand. It was a fine gesture and made things pleasant all around.

However, I can understand the annoyance it may cause a foreman when one of his men uses the birthday greeting card from the company



"He got along with all the men until they found out he had a television brain which was connected to a viewer in the front office."

AUTOMATIC CHUCKING MACHINE

There are no half-finished pieces lying around at the end of the day when you put your work on this outstanding machine.

The "1-2-3" feature—available only on the Goss & De Leeuw Automatic Chucker—provides the means of finish machining three ends of a part without changing set-up.

Note some of the typical parts machined. Ask for illustrated literature giving further details and send samples of your work for a cost estimate on handling it on the Goss & De Leeuw.

GOSS & DeLEEUW

GOSS and DeLEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

BARNES BLADES GIVE YOU . . .

SHARP
TOUGH
TEETH

FOR
HIGH-PRODUCTION
METAL SAWING

Barnes Hack Saw Blades have built-in cutting power. The teeth of all Barnes blades are milled to a fine sharpness, accurately set for balance, precisely heat treated for maximum cutting ability.

There is a Barnes high speed hack saw blade with specifications exactly suited to your application.

ROCKET (Flexible)

RED ARROW (18-4-1)

SERVICE (All-Hard)

When Cutting Counts—
Call Your Barnes Distributor!

BARNES

W. O. BARNES CO., INC.

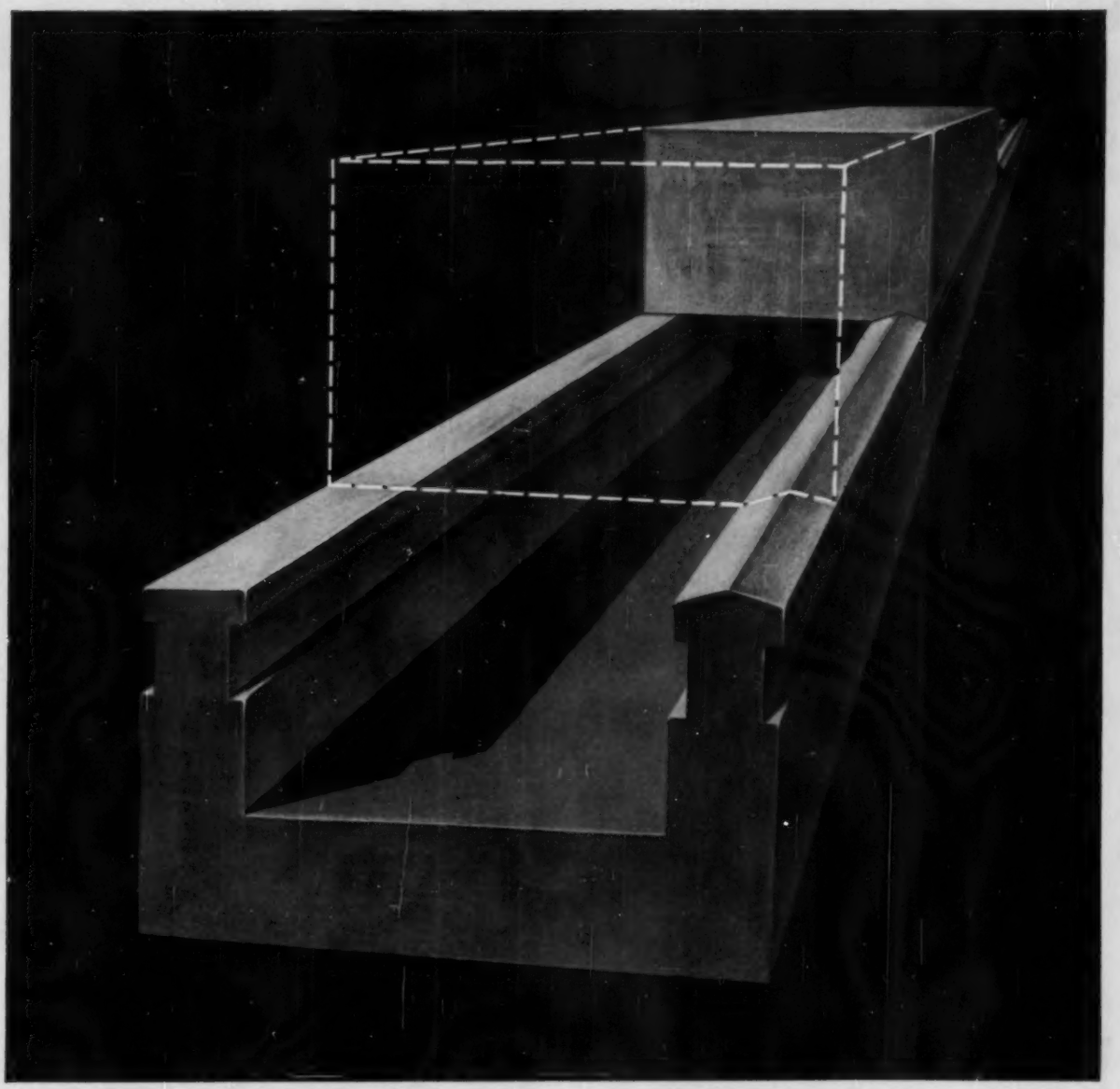
1397 TERMINAL AVENUE • DETROIT 14, MICHIGAN

as an excuse to hit him for a raise. It may be difficult for the foreman to counter a deserving worker's quip that if the company cared enough to remember his birthday it could remember that he hadn't had a raise in a year.

Of course a worker is entitled to ask his foreman for a raise if he feels he deserves one. Asking for a raise is a matter of principle to some employees. I once worked for a fine boss who had one bad trait: he wouldn't give his employees a raise unless they begged for one, or threatened to quit. As far as I was concerned, I refused to ask for what I thought I deserved and made up my mind I'd rather quit than do it. My wife thought I was stubborn as a mule. She said I should ask, like everyone else. If I'd have asked for a raise, I would probably have gotten one. But I felt I should rather stick to my principles—even though principles, unfortunately, sometimes have little cash value.

Bosses like the one I had follow the old saw that "the squeaking wheel" should get the grease. Unconsciously they like the sense of power it gives them to be asked for a raise. Because of their short-sighted policies they often let their best workers slip through their fingers. It certainly is the duty of every boss to examine carefully, and regularly, the worth of his employees. Companies with good personnel policies review once, twice, and even three times a year, their workers' performance. Those who deserve raises get them. Those who do not deserve a raise, should be told why. If the company is financially unable to pay more, then superior workers should be complimented on their work and told

"Sorry Sir, but you'll have to wait your turn."



for smooth, steady sliding way action

Febis K lubricants – specially formulated to prevent the irregular, stick-slip motion of slow-speed sliding ways in machine tools – are equally effective in higher speed operations. The special composition of Febis K lubricants gives them the unusual property of providing lower *static* friction than *sliding* friction. As a result, moving parts, starting with a low force, will not jump ahead. Febis K lubricants provide smooth, steady sliding action...assure better precision work. Febis K lubricants also help reduce wear because of their strong adhesion to sliding surfaces. And they have mild EP and rust-preventive properties. Febis K lubricants are available in *two* grades: *Febis K-53* – with the right viscosity for small- and medium-size machines; *Febis K-73* – for heavier machines and more heavily loaded machines. Both Febis K lubricants have passed the Cincinnati Milling Machine Company's stick-slip test and have been checked and approved by the Bijur Lubricating Corp. for use in their automatic lubrication systems. For further information contact your nearest Esso Standard Oil Company Division Office: Boston; Pelham, N. Y.; Elizabeth, N. J.; Bala-Cynwyd, Pa.; Baltimore; Richmond; Charlotte; Columbia, S. C.; Memphis; New Orleans.

FOR BETTER RESULTS

FEBIS K

Esso

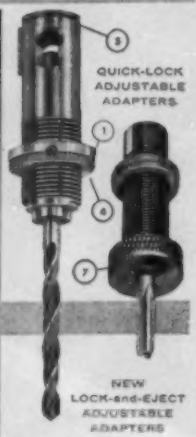
PETROLEUM PRODUCTS

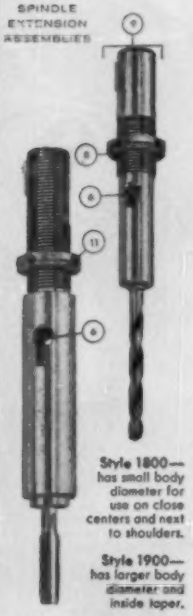
"FEBIS K"—Reg. U. S. Pat. Off.

Scully-Jones Adjustable Adapters

FOR PREMIUM PERFORMANCE OF DRILLS, TAPS, REAMERS

AT NO PREMIUM IN PRICE!





Style 1800—has small body diameter for use on close centers and next to shoulders.

Style 1900—has larger body diameter and inside taper.

These benefits . . .	for these reasons . . .	result from these PREMIUM features
INCREASED ACCURACY	No "cocking" or spindle distortion	1. Top face of quick-lock nut is square with threads.
		2. Locking shoe assures even distribution of pressure on all mating threads.
	Cutting tools run true	3. Bore and shank are concentric within .002 in. gaged 6 in. from adapter.
INCREASED PRODUCTION	Faster adjustment	4. Quick-lock nut locks any place on thread by only ¼ turn of set screw.
	Faster tool changes	5. Pilot nose eliminates "binding."
		6. Keyhole-type drift slot simplifies tool ejection.
		7. New Lock-and-Eject type eliminates use of conventional drift.
LOWER TOOL COSTS	Full use of adjustable range of adapter	8. Quick-lock nut is thinner than nuts used on most adapters.
		9. Small diameter permits use on close centers.
	Reduced tool breakage	10. Keyhole-type drift slot eliminates need for hammering with conventional drift.
	Adapter lasts longer	11. Friction-type nut prevents thread damage. Set screw does not contact threads.
		12. "Stressproof" steel induction hardened to give best combination of wear resistance and toughness.
	Solve pull-out problems	13. New Lock-and-Eject type increase holding power.

SCULLY JONES

Call your Scully-Jones factory-trained representative or distributor for complete information and prices.

PRECISION HOLDING TOOLS

"Precision Holding" for holding precision

Scully-Jones and Company, 1903 South Rockwell Street, Chicago 8, Illinois

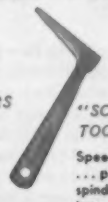
for profit-minded tool buyers!

COUNTERBORES and COUNTERSINKS

Give you rigidity and concentricity needed for accurate work, longer life.

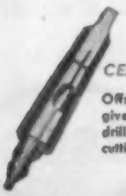
LIVE CENTERS

Take shock and abuse of heavy loads turning at high speeds.



"SCULLY-DRIFT" TOOL EJECTORS

Speed tool changes . . . protect tools, spindles, and bearings. Twist-of-the-wrist ejects tool or holder.



CENTER DRILL DRIVERS

Offset splined section gives positive drive in drill flutes and protects cutting edges.

DRILL STOPS

Make control of drill depth simpler, more accurate. Sleeve snaps out for fast tool change.

why no raises are possible. Experience has now taught me that where the boss is fine in all ways but the one of not giving his employees a raise unless they beg for one or threaten to quit, then it is better to appeal to his reasonable side. Tell him frankly that you do not like to ask for a raise. Ask that he review your work and pay at regular intervals. If he is fair-minded, he'll see your side, and you won't have to ask for what you've earned.

In the case under discussion, although the foreman's sensibilities may have been irritated by the one worker who used the birthday card from the company as an excuse to complain about his pay, the idea in back of birthday greetings to all employees is a good one. It will be found to be the exception rather than the rule that a demand for a raise will be based on the fact that a worker has received a birthday greeting card from the company.

The greeting card is a friendly gesture from the company that shows its consideration and thoughtfulness for its employees. It may only be a small thing but it has the power to create enthusiasm and promote good will.

Harry Kaufman
Philadelphia, Penna

PEACHES AND CREAM

I HAD BEEN employed about three months at this particular plant when I was amazed to see my name and my horrible picture among the several employees whose birthdays were acknowledged by the management in the plant magazine. Truly

24% savings in finishing costs and better forming with Formbrite

FINE DESIGN and a rich luster finish are the main sales features of the quality brassware manufactured by Coronet Brass, Incorporated, New York City.

Coronet's finishing operations, therefore, are of primary importance. Hearing about the outstanding polishing characteristics of Formbrite®, Anaconda's superfine-grain drawing brass, the company placed a trial order. The planter, jardiniere, and "leather-on-brass" waste basket shown above were among the first products made of Formbrite.

After several months of operation, Mr. Maurice Schulman, owner of Coronet Brass, summarized the company's experience with Formbrite as follows:

1. "We estimate that there is a saving of approximately 24% in our initial cutting operation, which represents about three-quarters of the complete finishing operation for our brassware.

2. "We further estimate that there is an approximately 20% difference in the color-buffing operation—the final step before the brass is lacquered.

3. "We have found that, on a small beading operation performed on one of our items, there is a time saving of about 50% due to the fact that Formbrite does not wrinkle as does regular brass in our automatic beading machine. The operation used to call for extreme vigilance, wasted much time. Now this substantial saving is possible because of Formbrite's springiness."

Formbrite
Superfine-grain drawing brass
an ANACONDA® product
made by
The American Brass Company

Find out for yourself. Formbrite is a premium product, yet it doesn't cost a penny more than ordinary drawing brass. Try it and see for yourself how its superfine grain, excellent drawing properties, strength, and scratch resistance can help you cut costs and make a better product. Get a sample or a trial batch. See your American Brass representative or write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont., Canada.

6774

Atrax PROGRESS REPORT

SOLID CARBIDE TOOLS

CASE HISTORY #16
MID-WEST HEAVY MACHINERY MANUFACTURER

Atrax
7/16" & 1/4" REAMERS
Series 1564

OPERATION	Reaming 7/16" x 1/2" deep hole Reaming 1/4" x 5/8" deep hole
MATERIAL	Cast Stellite, Rockwell C48
SPEED - FEED	7/16" dia.—350 r.p.m. 1/4" dia.—900 r.p.m.
PRODUCTION	100 to 180 holes per tool. Carbide **Tipped** reamer produced 10 holes. H.S.S. none.

CASE HISTORY #25
MAJOR AUTOMOBILE MANUFACTURER

Atrax
SPECIAL END MILL
3/8" diameter
Series 1507

OPERATION	Milling transmission bodies. Plunge 3/4" and slot 7/8"
MATERIAL	Cast Iron
SPEED - FEED	3840 r.p.m.—.0024 feed per revolution
PRODUCTION	60,000 to 70,000 slots per tool. Previously used 1000 H.S.S. End Mills per month, now uses 24 Atrax mills.

CASE HISTORY #42
MAJOR AIRCRAFT CORPORATION

Atrax H-183 and K-183 BURS

OPERATION	Burring
MATERIAL	Kirksite Dies
SPEED - FEED	15,000 to 20,000 r.p.m.
PRODUCTION	Solid Carbide Burs ran 1200 hours average before resharpening. Previously, resharpening H.S.S. burs cost company $100 a day.

Atrax

SEND TODAY for 96 page "STANDARD REFERENCE" on Carbide tooling!

THE ATRAX COMPANY
Newington 11, Connecticut

it gave me the feeling of belonging to the outfit. To use the modern youth's expression: my happiness was the most. It was a joy to know that I was a member of a family of happy employees whose employer saw fit to divert his mind from the clutches of the dollar while he took time out to recognize his workers as being individuals with hearts, instead of serialized robots.

In my many years of experience I have worked with too many individuals who scoffed at the idea of open recognition of an employee's birthday. They felt that such practice manifested nothing less than hypocritical and insincere poppycock. There are a surprising number of people who look with grave suspicion upon any employer who puts out a helping hand. These emotional cocked-hats are in the great minority, thank goodness, and unfortunately do not lend their influence toward better relations between employer and employee. They are obsessed with the idea that in any gift there is a taint of fish. "I'd rather be given a swig of ether and get it over with instead of being played with as a cat does with a mouse before the gulp," one grouchy individual volunteered.

One of my old bosses, who has long since passed into the realm of non-taxable bliss—the reward for his big-heartedness toward his workers—couldn't stand to see his men eat their lunches out of sacks and nose-bags when the temperature hovered around fifty below. He went to the trouble of fitting out a complete kitchen and dining room for their explicit comfort. There were no strings attached; he went on the

(Continued on page 206)

"I was having a little argument with the shop foreman, and he walked out on me!"

BAUSH

8-Way Unit Machine with Rotary Table

Completely **machines exhaust manifolds from rough casting to finished job at rate of 100 per hour**

Exceptionally rugged to stand up under continuous 3-shift operation with a minimum of down-time, this NEW BAUSH SPECIAL 8-WAY UNIT MACHINE consists of:

- 2 Vertical hydraulic units mounted on cross slide
- 1 Vertical angular hydraulic unit mounted on sub-base
- 1 Vertical hydraulic unit mounted on horizontal slide
- 3 Vertical angular mechanical leadscrew units
- 1 Vertical angular hydraulic unit

Units are equipped with 3 milling heads, 2 spherical cutting heads, 2 drilling heads and 1 individual leadscrew tapping head. Hydraulic "V" jaws clamp part into 8 holding fixtures mounted on an 80" diameter rotary table having paddles that automatically dispose of chips to outside of machine.

Total weight 110,000 lbs.

Closeup of fixtures showing manifold in position for machining.

Send us your problems and prints — let us design and build your next single purpose multi-spindle machine tool. We have the experience and "know-how," backed by over 60 years of making machines that will "stand-up" to any job.

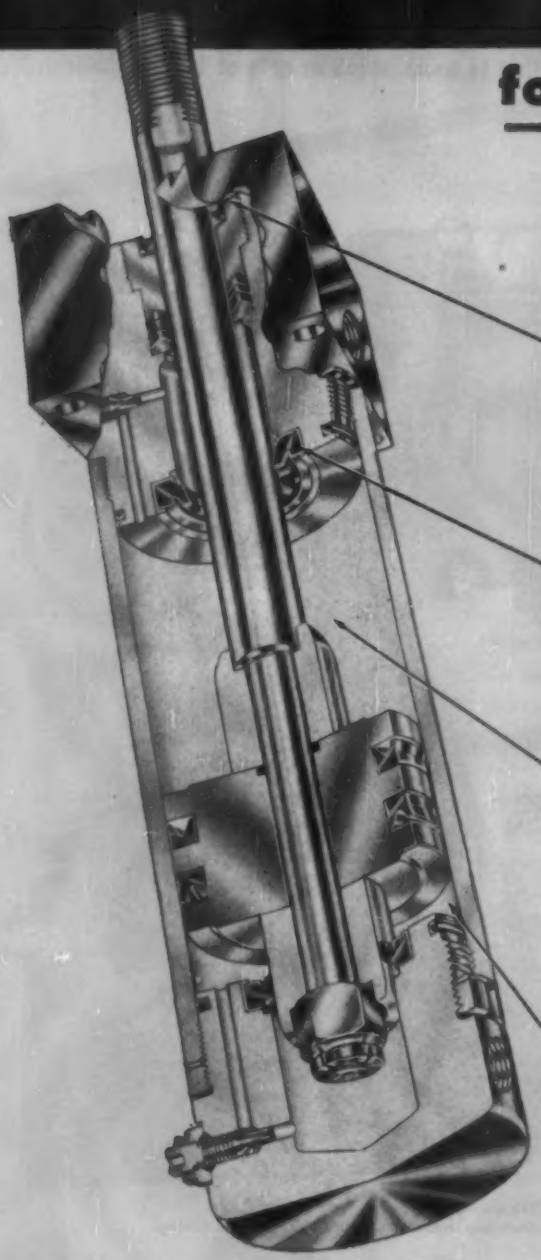
BAUSH machine tool co.

SPRINGFIELD 7, MASS.

Need a cylinder today?

for all these Extras . . .

T-J Spacemaker



PISTON ROD SCRAPER . . . Not just a felt or fabric wiper, but a metal to metal contact. Protects rod packing and cylinder bores at all times by actually removing foreign particles from piston rod surface. STANDARD AT NO EXTRA COST!

NEW "SUPER" CUSHION FOR AIR . . . Of T-J design and patent, it assures millions of trouble-free cycles. Years of T-J research and test have answered the problem of "how to make a cushion last". All T-J cushions are adjustable, STANDARD AT NO EXTRA COST!

CHROME PLATED CYLINDER BORES AND PISTON RODS . . . The piston rod, of course. But of these two features, the chrome plated bore is by far the most important, due to the much greater area that is subject to wear. Chrome plating of bore gives extra protection where needed most. Also a protection from condensation and foreign matter, that may find itself into the system. STANDARD AT NO EXTRA COST!

ONE PIECE PISTON . . . Giving you three point surface bearing which increases the distance from the piston end to the rod bearing. This T-J feature assures better alignment, longer bearing and packing life. STANDARD AT NO EXTRA COST!

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at no Extra Cost!

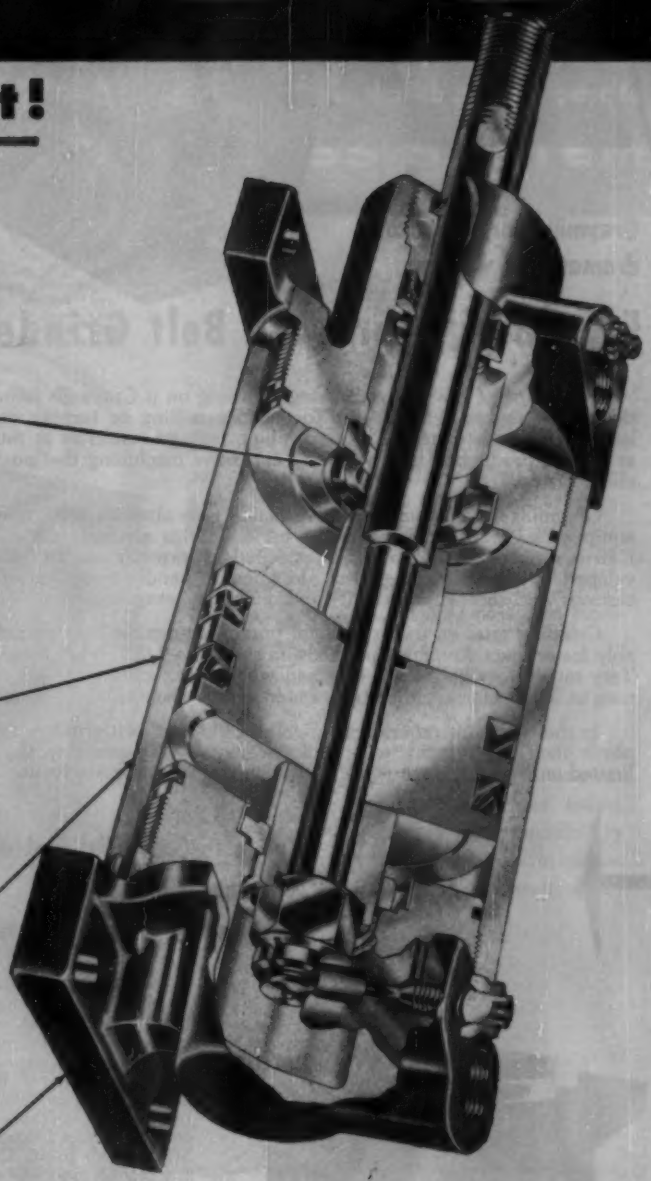
cylinders

NEW "SELF-ALIGNING" MASTER CUSHION FOR HYDRAULIC USE . . . (Pat. Applied For) New T-J cushion design eliminates problems of worn out, or out-of-line cushion seals. Eliminates need of a ball check while greatly increasing the return flow, assuring fast breakaway on return stroke. All T-J cushions are adjustable, STANDARD AT NO EXTRA COST!

NO TIE RODS TO STRETCH . . . By eliminating tie rods, the T-J SPACEMAKER gives you 360 degree port rotation, streamlined design, no tie rod stretch, without sacrificing strength. STANDARD AT NO EXTRA COST!

STREAMLINED DESIGN . . . Minimum center-line to center-line mounting—years ahead and in keeping with modern trends. Easy to clean for an extra appearance on your machine, without sacrificing strength. Oil pressure to 750 P. S. I.—air to 200 P. S. I. STANDARD AT NO EXTRA COST!

FORGED SOLID STEEL HEADS . . . (4" bore through 8" bore) Requires no additional mounting brackets, because mounting holes are a part of the one piece solid forged steel head. Its design lends itself to smooth streamlined modern appearance. STANDARD AT NO EXTRA COST!



WRITE TODAY for new bulletin with complete details of the T-J Spacemaker line, or call Jackson, Michigan, State 2-0462.

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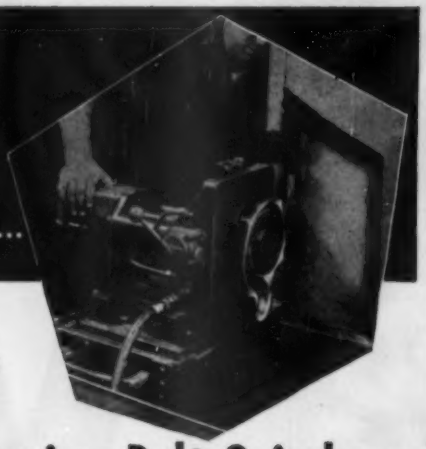
RIVITORS . . . AIR AND HYDRAULIC CYLINDERS . . . REAMERS . . . CUTTERS . . . CLINCHORS

When shape and inaccessibility makes flat-surface machining of pump housings difficult...



Graymills Corp. cuts costs dramatically with an

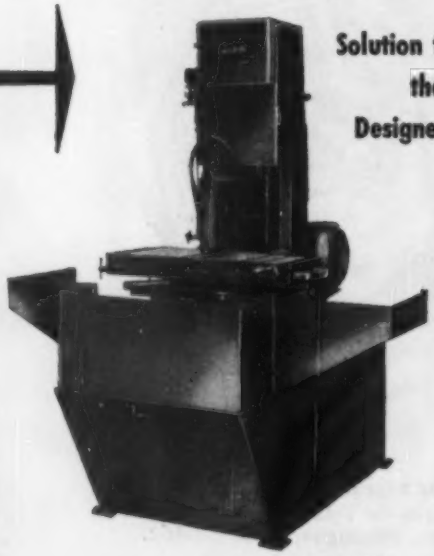
Engelberg Abrasive Belt Grinder

The shape of the intake-discharge housing on a Graymills immersion pump makes it unsuitable for surface milling or turning on a lathe. When either method is used, pump leakage results in as much as 10% of production runs, requiring corrective machining that pushes unit costs up.

Graymills installed an Engelberg platen type abrasive belt grinder, equipped with an automatic infeed table. To this machine (the BG8-FT9 described below) Graymills attached a draw-bar air fixture developed by their own engineers, designed to handle several sizes of castings with short run flexibility and minimum setup time.

Grinding rates on the grey metal pump castings are now considerably faster than alternative methods, in spite of a 1/32" stock removal. Very satisfactory belt life is obtained with 24-grit silicon carbide running at 5,000 s.f/m., cooled by a water-soluble chemical.

In the Graymills experience, Engelberg abrasive belt grinders again prove their adaptability to specific needs . . . adaptability that is limited only by the ingenuity of the engineers who program its use.



Solution to Graymills' Problem:
the BG8A-FT9
Designed for Mass Production

● Fast machining by wet or dry abrasive belt, backed by ground steel platen. Presetting controls rate of feed and pressure. Quick approach of ball-bearing table is followed by slower, hydraulically controlled infeed down to Micro-Stop limit. Does fine tool room jobs of surfacing, squaring, grinding angles, bevels, radii, etc.

For complete information on this and other Engelberg Abrasive Belt Grinders, write . . .

The ENGELBERG HULLER Co., Inc.
181 Seneca St., Syracuse, N. Y.

ENGELBERG
Precision ABRASIVE BELT GRINDERS

theory of treating his workers as he would want to be done by were he again in the shop as an employee. He made no charge for the food he had served—and it was good—but he let it be known that he expected payment in conscientious effort and loyalty to the company. There were some who took exception to this and no doubt developed ulcers because of their suspicious attitude.

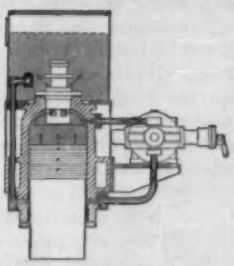
The sending of birthday cards is one of the many things conceived of as being an element of psychological benefit wherein the feeling of being recognized constitutes an aid to better understanding and cooperation between employer and employee. Just imagine, if you will, the feeling of warmth in an individual if an employer should approach him and offer his best wishes on the occasion of his birth! Of course such a thing could only be possible in a very small plant, yet, an effective substitute, such as coming from the employer's representative (Personnel) would be more desirable than not at all. Of course we can see where some would console themselves in giving out with a smart crack, in effect: "Now what in hell gives!"

Many successful manufacturers today owe their progress to the vision of "persons before things" in which the feeling of brotherhood goes along with material progress. The idea of claiming that an increase in pay should be given instead of a "valueless" card is irrelevant. An increase in take-home comes as a reward for unusual effort and expert accomplishment and has no bearing on the worthiness of birthday or anniversary recognition.

I cannot see where Murphy has justification for his gripe about the company needing to remember about

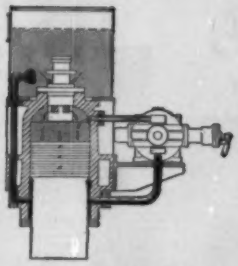
"You the one that's been griping about the air conditioning?"

HERE'S WHY H-P-Ms PAY OFF



Fastraverse Ram Advance

Is controlled by rate pump; withdraws oil from supporting area. FASTRAVERSE prefill system augments oil to main cylinder from overhead reservoir during advance stroke.



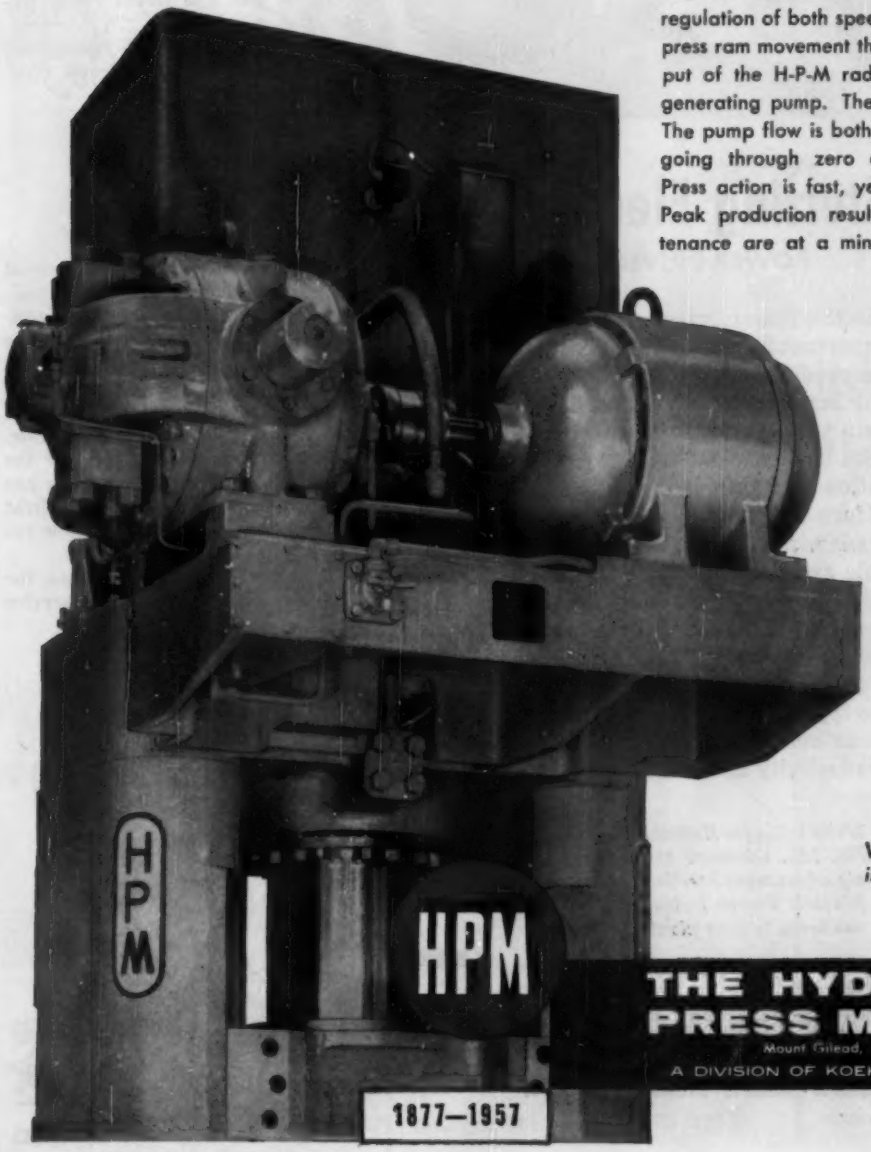
Fastraverse Ram Return

At reversal, pump delivers oil to supporting area by reversing direction of oil flow through pump. At this time, FASTRAVERSE prefill system opens and allows excess oil not handled by pump to be discharged back to tank.

FASTRAVERSE CLOSED CIRCUIT PRESS SYSTEM

Automatic Speed and Cycle Control

The H-P-M "Closed Circuit" system provides regulation of both speed and direction of every press ram movement through control of the output of the H-P-M radial piston type pressure generating pump. There is no reversing valve. The pump flow is both variable and reversible, going through zero at each press reversal. Press action is fast, yet smooth and shockless. Peak production results; idle time and maintenance are at a minimum.



Thousands of H-P-M FASTRAVERSE presses are in service today. Their dependability through performance is your assurance of satisfaction.

Write for complete information Bulletin 5500

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his not having had an increase in pay for a year. Being an employee is a business proposition, and it is up to the employee to remind others about an increase. However, before he sticks his fat neck out he should make damn certain that his application is justified by his effort and all-round worth as an employee.

As you prove yourself as a worker so will your boss adjudicate your true value to the company whose interests he is obligated to protect. Don't get the idea, Mr Murphy, that any period of time regulates the making of an increase in pay. Many employees posterior to you are more worthy of an increase in pay because of their conscientious effort at all times to make themselves worthy. Until you get the lead out of your thinking you will never reach the pot of gold.

J Homewood
Laguna Beach, Calif

PAYOFF ON THE SLY

Is it possible to give a man a special raise for work unusually well done, a raise outside of regular routine increases? If it is done, should it be kept secret, or made public?

WHEN AN employee is hired on a new job he is told the starting rate. He is also told the top rate for the job. He usually knows what he has to work up to. If he is a machinist or toolmaker he need only show his ability to reach top rate.

On many machine operations the employee has to have both service

(Continued on page 213)

Improve Monday morning efficiency—switch to STUART SOLUBLE OILS with guaranteed longer service life!

Anaerobic bacteria (present in practically all machine shops) thrive in your water-mix cutting and grinding fluids and generate that expensive perfume known as "Monday Morning Odor." Expensive because it's a sure sign the stability of the compound is being damaged—service life shortened—and because your workers' efficiency is bound to suffer.

So regardless of your experience with other bactericides, it will pay you to try Stuart's heavy-duty soluble cutting and grinding compounds with the anaerobic bacteria inhibitor that's *guaranteed* to keep the emulsion stable and sweet three to four times longer than other water mixtures . . . even in hot weather and through long shutdowns when bacteria multiply fast.

LONGER SERVICE LIFE GUARANTEED

Talk the problem over with your Stuart engineer and place a trial order for Solvol "X," Codol "X," Dasco Super Soluble "X" Base, or new general-purpose Dasco D-20—whichever of these top-quality, heavy-duty cutting and grinding compounds best fits your needs. D. A. Stuart Oil Co., Limited *guarantees your complete satisfaction* with the bacteria resistance of these compounds, on a money-back basis ! Phone your Stuart Service Center . . . before "Monday Morning Odor" hits your plant for another efficiency loss.

Find Your STUART Rep. In The Yellow Pages

Phone your Stuart Service Center

Arrange now to test Stuart's water-mix cutting and grinding fluids on your difficult machining jobs.

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METALWORKING LUBRICANTS

BASO INC.,
GOT RUSTPROOF, GASTIGHT VALVES
WHEN THEY SWITCHED
TO ALCOA ALUMINUM
SCREW MACHINE
STOCK

Baso Inc., pioneered the thermoelectric controls that make wonderful things happen in America's homes. Gas ranges, clothes dryers, heating units turn themselves on and off automatically.

Brass was formerly used for Baso valve cocks, but these parts were converted to aluminum in conjunction with a complete switch to aluminum for valve bodies. This change entirely eliminated any corrosion problem that might occur between dissimilar metals. With one pass of a single-point tool, Baso gets a surface finish of 16 micro inches in a cycle time of 18 seconds (machine capacity). The lapping operation required with brass was eliminated and so were gaskets, for the metal-to-metal aluminum seal proved to be gastight.

If you machine parts from steel or brass, now is the time to take a hard look at these economic facts about aluminum:

1. Aluminum costs less than brass, and machines just as fast.
2. Aluminum machines faster than steel and won't rust.
3. Aluminum scrap allowance is high.

Now is the time to switch to Alcoa® Aluminum. To help you make that switch, call on your nearest Alcoa sales office. For immediate delivery of screw machine stock, contact your nearest Alcoa distributor. ALUMINUM COMPANY OF AMERICA, 868-H Alcoa Building, Pittsburgh 19, Pa.

IN DESIGN

Russell Matthews, Director of Product Engineering (left), discusses aluminum backing for valve facing with James Dowd, Director of Industrial Engineering. Mr. Matthews says, "Alcoa helped us start redesigning with aluminum back in 1948. Our conversion from brass is now complete."

IN PURCHASING

Mr. G. C. Winters, Director of Purchasing, says, "We have never had to reject Alcoa stock either from the mill or from its local distributor. We find both very cooperative in making deliveries to meet production schedules, thereby saving us warehouse space."

Visit the Alcoa-National Acme Cooperative Machining Demonstration, National Acme Company, Cleveland, Ohio, September 10 & 11, 1957.

ALCOA ALUMINUM SCREW MACHINE STOCK

WE CHOSE ALCOA ALUMINUM SCREW MACHINE STOCK

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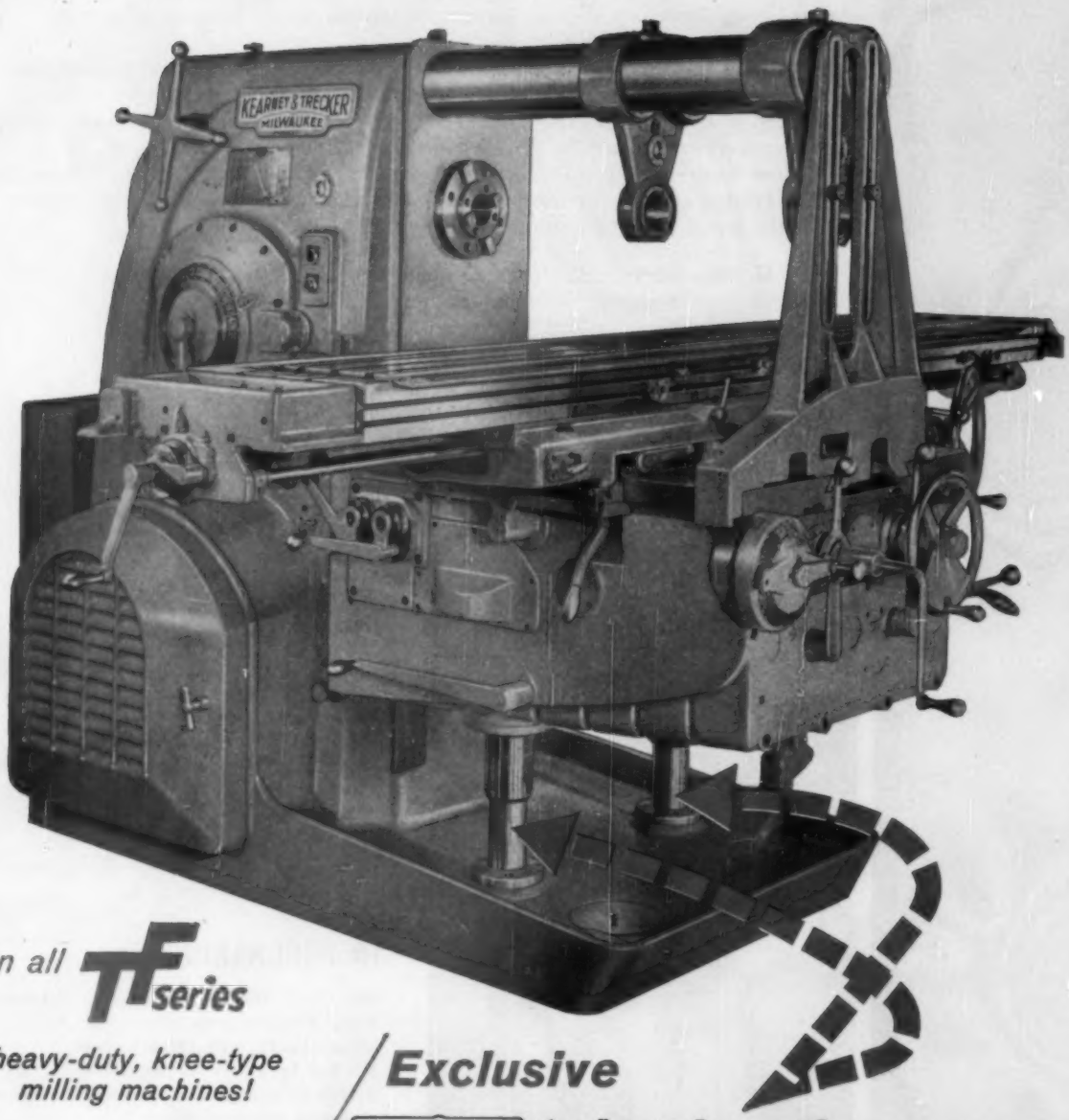

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over single screw designs

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and ability to reach top rate. Some employees never reach it because of poor attendance records, low output, or doubtful quality. On the other hand we have employees who stand head and shoulders over others in both quality and output. Very often these employees will make more than what is considered top rate.

Even when we have employees of equal ability, there is always the fellow who comes through with valuable suggestions and new ideas. Why should not these eager beavers be rewarded in some tangible way? When an employee stands out above others he should be paid accordingly. If one company doesn't pay him, some other will. If other employees complain, simply tell them why this worker makes more money.

A E Salmons
Norristown, Penna

PAYOFF ON THE SLY

If we are apt to give the devil his due, why not see justice carried out when a good man deserves recognition? A company has every right to reward when it sees fit to do so. Even though it may be policy to give increments at set times, a company may change its policy as a woman changes her mind.

No doubt a foreman will experience a comeback on occasion when he rates one man higher than another. Nevertheless, coping with such retorts is part and parcel of the added responsibility he assumed when he accepted his own promotion. For that matter, he is liable to encounter opposition when he gives any sort of an order, for he can't please all of the people all of the time.

If an explanation of his decision is sought by those who were not included in a merit increase he might well find this a good opportunity to practice a little pedagogy. Frequently a man's viewpoint of his job is very limited because he has succeeded in collecting a pay-check by applying the only fund of knowledge and information that he is aware of. However, if he is sincerely interested in learning why his co-worker rates higher, he is very docile material for instruction that could result in a higher standard of production.

Let's not be afraid to give credit where credit is due for there is no need to hide one's light under a bushel.

Perry G Conway
Philadelphia, Penna

. . . PUT UP THE WIND SHIELD, NELLIE

When the going got dusty back in 1907, Nellie had to put up the "wind shield" on this early Pope-Toledo. Mamma was too busy with spark, throttle, mixture, lubricator, cone clutch, progressive shift, bulb horn, two-hand steering and hand-and-foot brakes to do that too. And can you imagine what that gritty, billowing dust did to the EXPOSED *gears*, protected only by some sticky, poor-grade grease? No wonder tolerances were generous — and gear life short!

Into this pioneering atmosphere plunged John Christensen and Soren Sorensen, to start in the gear business. The problems that faced them then were different than those we face today, but we still adhere religiously to their formula for meeting them — do the best job possible every time, and be sure it's done a little better than anyone did it before. We think that's the main reason we've built up such a satisfied list of steady customers over the past 50 years. We'd like to add *you* to this list too — why not give us an opportunity on your next custom gear order?

THE CINCINNATI GEAR CO.
CINCINNATI 27, OHIO
Fifty Years of "Gears—Good Gears Only"

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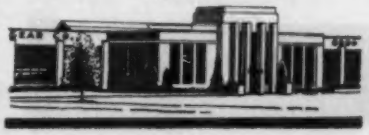

available in ratios of 5 to 1 to 60 to 1

Perfection Worm Gear Speed Reducers by American Stock Gear are available with ratios ranging from 5 to 1 to 60 to 1 for input revolutions ranging from 300 per minute to 1800 per minute.

Speed Reducers may be furnished with worm on top or bottom as desired. Integral worm and shaft is made of selected quality, case hardened alloy steel. Shafts are mounted in Timkin anti-friction roller bearings. Oil seals are of selected cirvis leather which assures maximum sealing effect. Available through your nearest American Stock Gear Distributor. If you don't know his name, write us.

Write for 12 page Bulletin No. R-30 listing the complete Perfection Series together with tables and other important engineering data.

AMERICAN STOCK GEAR DIVISION
PERFECTION GEAR COMPANY
HARVEY, ILL., U.S.A.

New Books . . .

TECHNICAL DESCRIPTIVE GEOMETRY (Second Edition)—*By B Leighton Wellman, Professor of Mechanical Engineering, Worcester Polytechnic Institute. Published by McGraw-Hill Publishing Co, 330 W 42nd St, New York 36. 628 pages. Price $5.75.*

Like many technical books reviewed in these columns, this is primarily a school text—first-year-college level. And like many similar books, it may also be used for reference if an engineer or production man should run into trouble involving vectors, intersections of surfaces, and problems involving different views of work being drafted. In no sense is it a handbook, but it can be considered a reference book in its specialized field.

As usual with modern textbooks, this one has ample illustrations and straightforward organization. The author follows one main theory throughout the text: Geometric views of solid objects should be constructed by rules and principles, not by insight or some other fallible system, so the designer knows when he gets through that his drawing is correct.

•

ENGINEERING MANPOWER: HOW TO IMPROVE ITS PRODUCTIVITY—*A Special Report for Management by Graduate Students at the Graduate School of Administration, Harvard University. Published by Engineering Management Reports, P O Box 161, Cambridge 38, Mass. 162 pages, 8½ by 10¾ in. Paper cover. Price $18.50.*

This research report, the work of nine students at the Harvard Graduate School of Administration, examines the current shortage of scientists and technical personnel and suggests ways that industry can improve the productivity of its engineering manpower. Information for the survey was obtained from a cross section of industrial corporations located in all parts of the country. A wide variety of other organizations—colleges, management consultant firms, government agencies, etc—were also consulted.

Chief conclusion reached by the group that conducted the survey is

(Continued on page 217)

DI-ACRO ROD PARTER

Make several thousand burr-free cuts per hour in bar stock

Combination shearing-breaking action parts bar stock without burring and minimum distortion. Handles up to ⅜" round bar stock—square, rectangular, and hex shaped bar stock can be parted when machine is equipped with special die heads.

Material range is from hot rolled bar stock to stainless steel and other high alloy materials. The harder the material is the better it parts.

Long lasting die heads can be reversed before resharpening—can be sharpened many times. Standard cutting heads in No. 2 and power models have 10 graduated holes from 1/16" to 3/8"; No. 1 Model has eleven holes. Optional die heads for parting scaly hot rolled bar stock. *at no extra charge.*

Speed-Matic Gauge, an accessory on power model, enables machine to part off several thousand short pieces an hour. *Send us samples for test cutting or consult the Yellow Pages of your phone book for the nearest Di-Acro distributor.*

Hand operated model also handles up to ⅜" rods.

Di-Acro Power Parter with stock stand and Speed-Matic Gauge.

This ⅜" stainless steel bar stock has been "parted" in a Di-Acro Rod Parter. Shiny edges show where rod was sheared, then fractured or "parted off." Will clear hole its own diameter.

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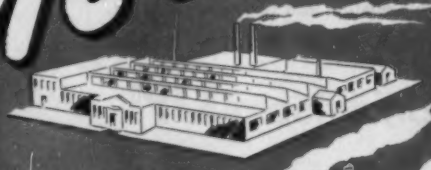

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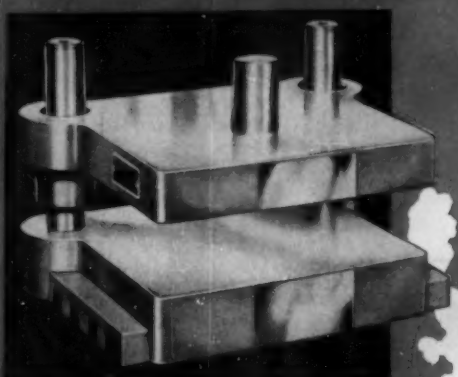

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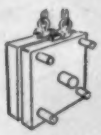
SUPERIOR die sets manufactured of quality materials . . . world-renowned for their long, accurate press runs. Speed-up handling from bench to press.

SUPERIOR offers complete engineering and manufacturing facilities at plants in Milwaukee and Plainville to produce *standard* or *special* die sets from the smallest to the largest. Over 33 years of manufacturing die sets to do your job BETTER, FASTER and at LESS COST.

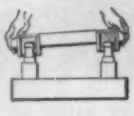
Exclusive SUPERIOR TIME and MONEY SAVING *Features*

SAFETY FLANGE
protects fingers by providing roomy gripping space on either side of the die shoe.

LOCK-JAW LIFTING DEVICE
removes the danger of handling large die sets.



E-Z LIFT SLING CHAIN
attach to the lock-jaw for immediate lifting.



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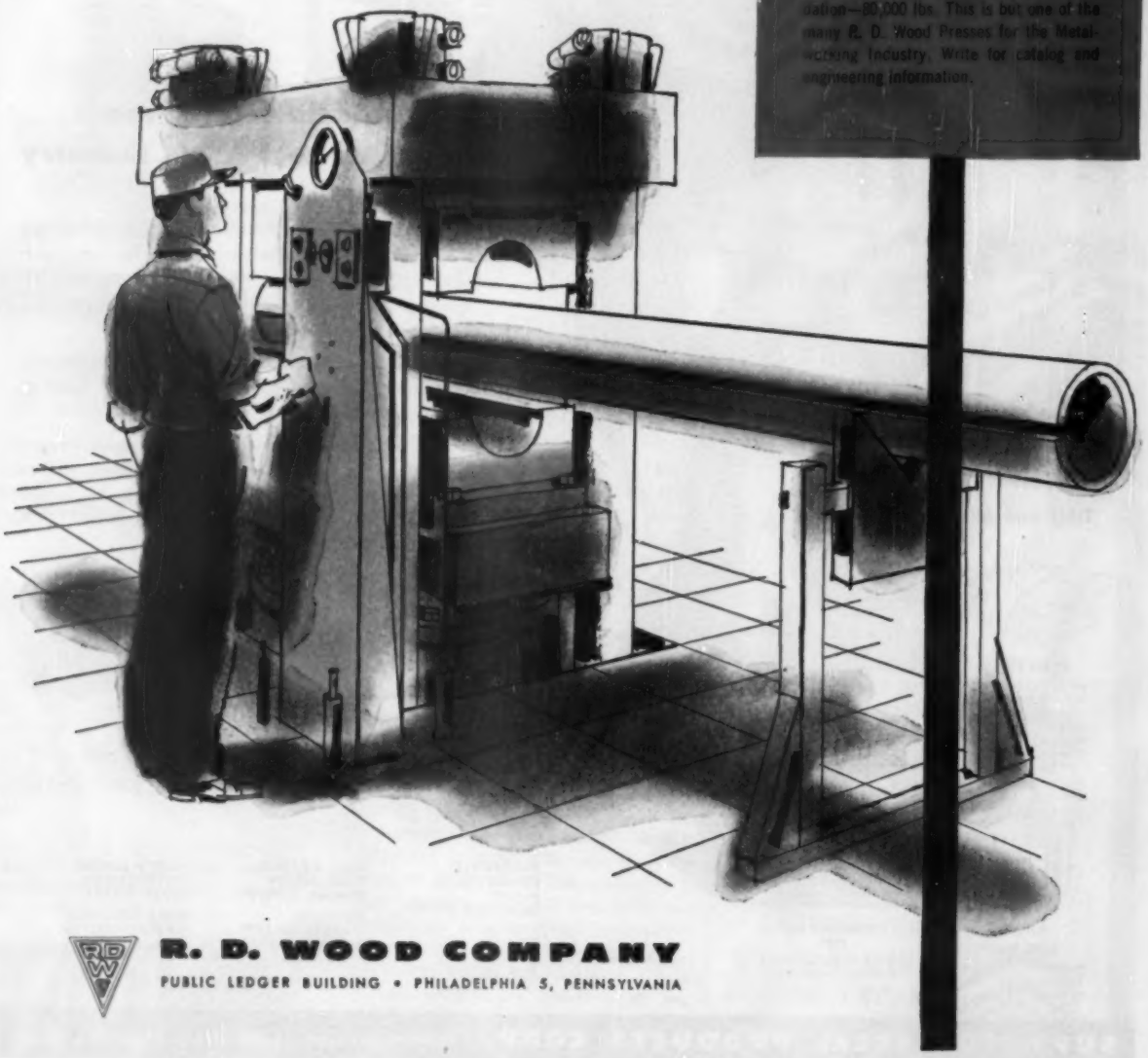
1500 ton R. D. Wood Hydraulic Press for pipe forming operations. Press has self-contained pumping unit. Dies can be replaced for various sizes of pipes ranging from 4" to 12". Floor space, press proper—9' x 6'. Height—13'. Weight on foundation—80,000 lbs. This is but one of the many R. D. Wood Presses for the Metal-working Industry. Write for catalog and engineering information.



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that the manpower shortage can be alleviated greatly if management will learn how to utilize effectively the manpower it already has. "In our opinion engineering productivity is being wasted to a considerable degree at the present time."

Management often does not understand its engineering needs, the reports states, "because non- technically trained executives seem to be out of touch with the problems and requirements of their engineers." The result is that hoarding and stockpiling take place, ineffective recruiting campaigns bring in the wrong kind of personnel, and the engineer himself is not fully aware of his duties or of his position within the company.

The report offers many suggestions for improvements in such areas as organization, planning, hiring, training, leadership, and personnel administration. For the most part it is an objective survey that is more than a statistical study; its conclusions are realistic and its recommendations are positive. An extensive bibliography is appended, and several survey worksheets are included to show methods used by the group to get information for the report.

•

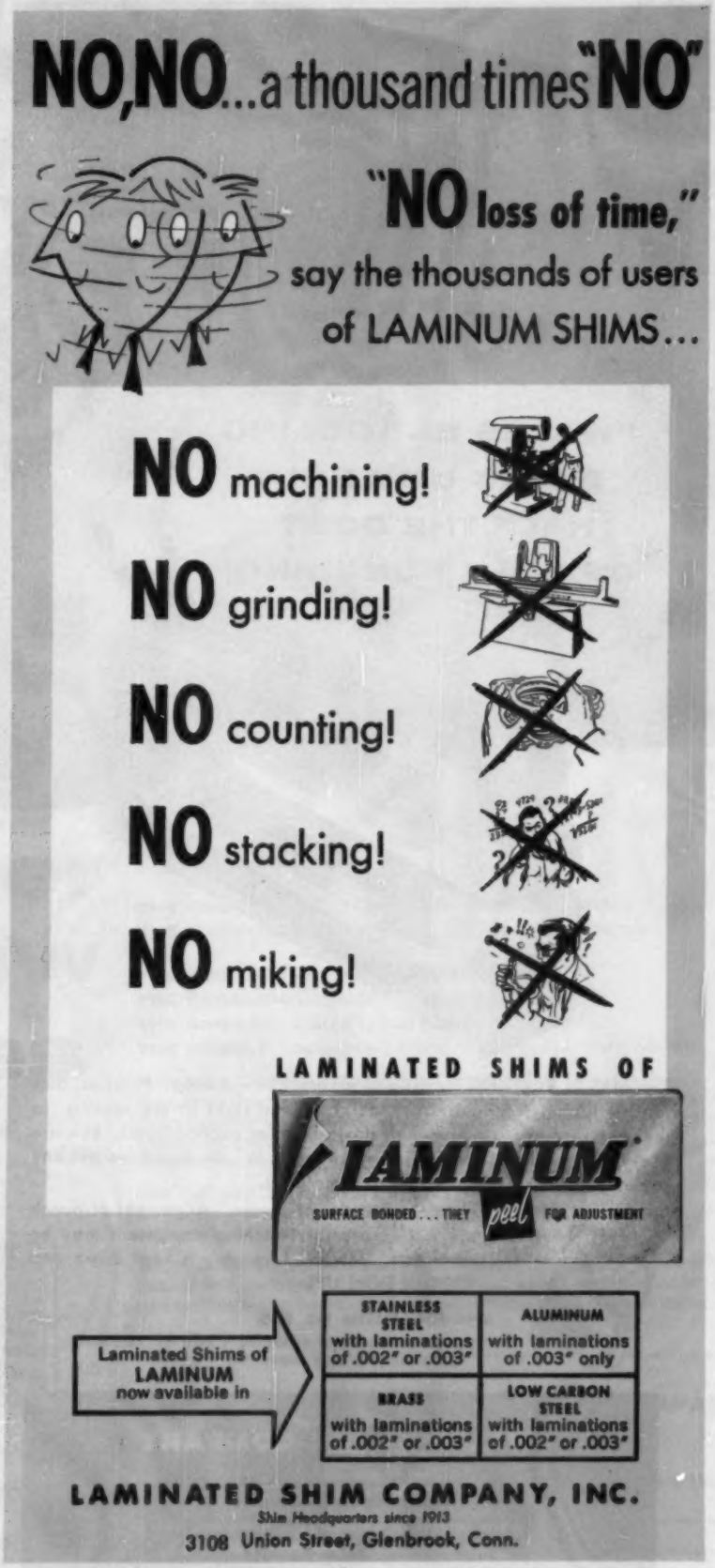
WHO MAKES MACHINERY? *Published by Nordeman Publishing Co Inc, 14 E 62 St, New York 21, NY. 800 pages 4 x 10. Price $3.50.*

Available in English, German, French, Italian and Spanish editions, this official guide to German suppliers of machinery, equipment, and special tools provides an alphabetical directory of 9000 product classifications, directory of manufacturers' names and addresses, and a classified directory of 20,000 suppliers of equipment of all types, from machine tools to office machines.

•

MACHINE TOOLS: WHAT THEY ARE AND HOW THEY WORK—*By Herbert D Hall and Horace E Linsley. Published by The Industrial Press, 93 Worth St, New York 13, N Y. 436 pages. Price $5.50.*

This is a new book, a successor to The Machine Tool Primer, and was actually written by "Jim" Linsley, Associate Editor, AMERICAN MACHINIST. It was designed to give a broad understanding and insight into metalworking for general readers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"NO loss of time,"
say the thousands of users
of LAMINUM SHIMS...
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SURFACE BONDED... THEY peel FOR ADJUSTMENT
Laminated Shims of LAMINUM now available in
STAINLESS STEEL with laminations of .002" or .003"
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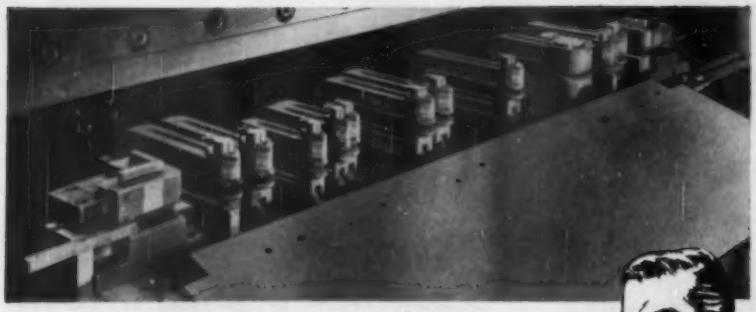

"WALES BL TOOLING SAVES US ABOUT HALF THE COST OF HOLE PUNCHING"

"WALES BL TOOLING is fast and accurate in our shop. Punches, dies and stripping mechanism are all contained right in the tooling, so our presses have a minimum of down time for change-overs. BL's are just about perfect for punching stock up to ⅛" thick and we get any type of pattern needed with the same units."

Nothing attached to the press ram. Alignment of punch and die is permanent. Notching equipment may be used in same set-up. Inventory is kept down and PRODUCTION UP!

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The complete story of BL tooling is here for the asking. Send for your copy today.

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as well as students. Writing style is simple and straightforward, but there is plenty of meat in the text.

The author starts with the basic concepts of manufacturing, hitting each one briefly but with enough to detail to have meaning. He covers, for example, shell molding, extruding, machining, welding, and painting—all the basics. He then covers the theory and development of mass production, and discusses the kinds of skills required in industry.

Farther on, he describes production planning, time-and-motion study, tooling in general, and finally; the five basic machining operations—drilling, turning, shaping, milling, and grinding. In later chapters he covers special machines, presses, and automation.

The book is unusual in that it combines many of the better elements of education in metalworking; the latest processes as well as the old standbys, well-chosen illustrations, short but specific descriptions of present-day equipment and what it does, and a more complete roundup of all the elements in metalworking than is usually included in a textbook. Actually, this is a survey of the field that could be helpful to anyone interested and not fully informed.

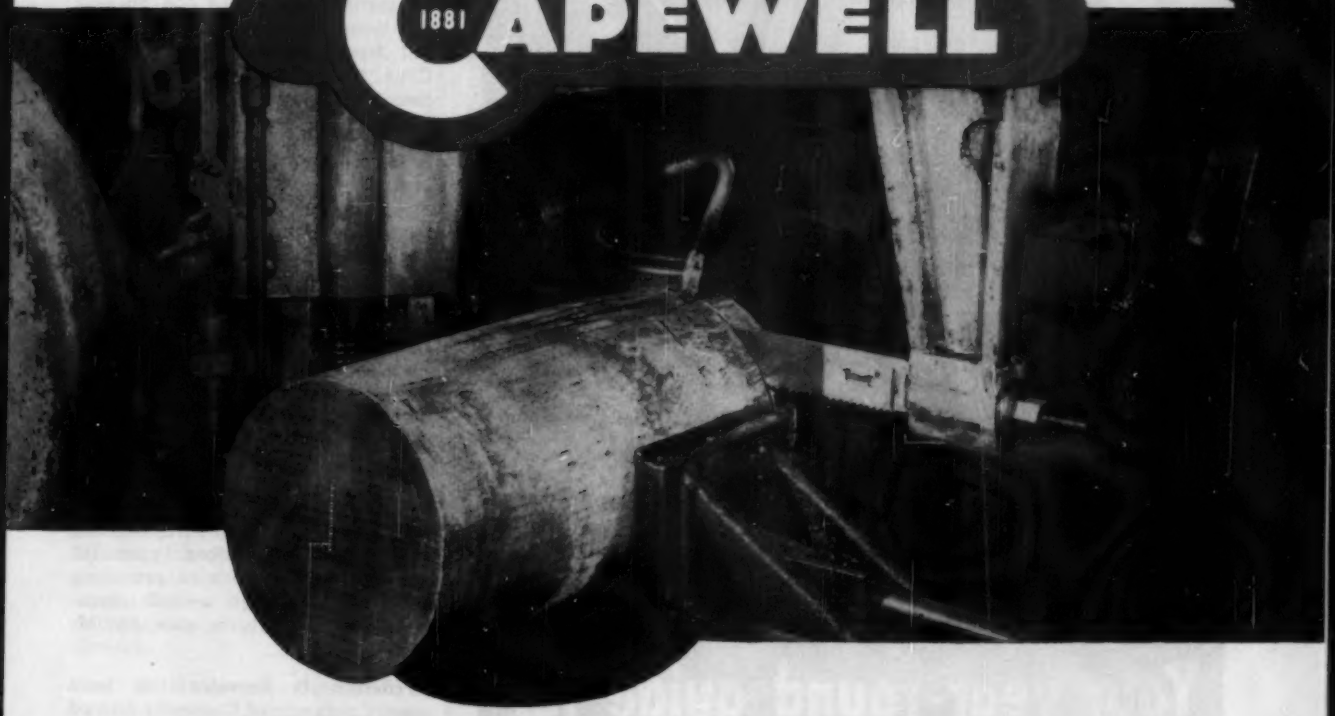
•

LINEAR PROGRAMMING—*By Dakota Ulrich Greenwald. Published by Ronald Press Co, 15 E 26 St, New York 10, NY. 75 pages, 5½ by 8¼ in. Price $3.*

Requiring no mathematics beyond college algebra, this book offers a simple yet thorough explanation of linear programming—its advantages and its limitations. Emphasis is on pencil-and-paper solutions rather than on machine methods, because most potential users of linear programming will not have access to electronic computers. Sample problems, graduated in difficulty, are placed throughout the text, so that the reader can apply the techniques explained in the book to problems as they develop. The standard problems that linear programming attempts to solve—how to effect optimum usage of machine tools, what product mixes will bring the best returns in sales, how to schedule production of a part so that maximum machining time is available—are here examined in detail. The computation method used to solve the problem is the simplex algorithm, which permits hand-computed solutions for small-scale problems.

cut it with stop

1881 CAPEWELL



power hack saw blades

THE USER: M. W. Kellogg Company's Electric Products Department

THE MATERIAL: Super Alloy Ingots of Kellogg's own manufacture—ASM 5728, 5733, 5735, etc.

THE JOB: Cutting jet aircraft forging steel

THE PROBLEM: Crooked cuts . . . too few cuts per blade

THE ANSWER: Capewell Technite Power Hack Saw Blades

THE RESULT: Accurately perpendicular cuts . . . blade life greatly extended

M. W. Kellogg Company's Electric Products Department chose Capewell's Technite Molybdenum High Speed Blade for this exceedingly tough cutting job because Technite blades completely eliminated sawing difficulties, not only in comparative tests but in continued production use, by providing highly accurate cuts under heavy feeds . . . and with an unusually long blade life.

Other high speed Capewell Power Hack Saw Blades, Safetech and High Speed, are also designed to assure the maximum sawing performance and meet today's accelerated production line requirements.

You, too, can improve your production by standardizing on Capewell Power Hack Saw Blades. Tooth by tooth, you'll find that Capewell blades are a superior product, manufactured to rigid specifications, so that you can be assured of blades that stay sharper longer.

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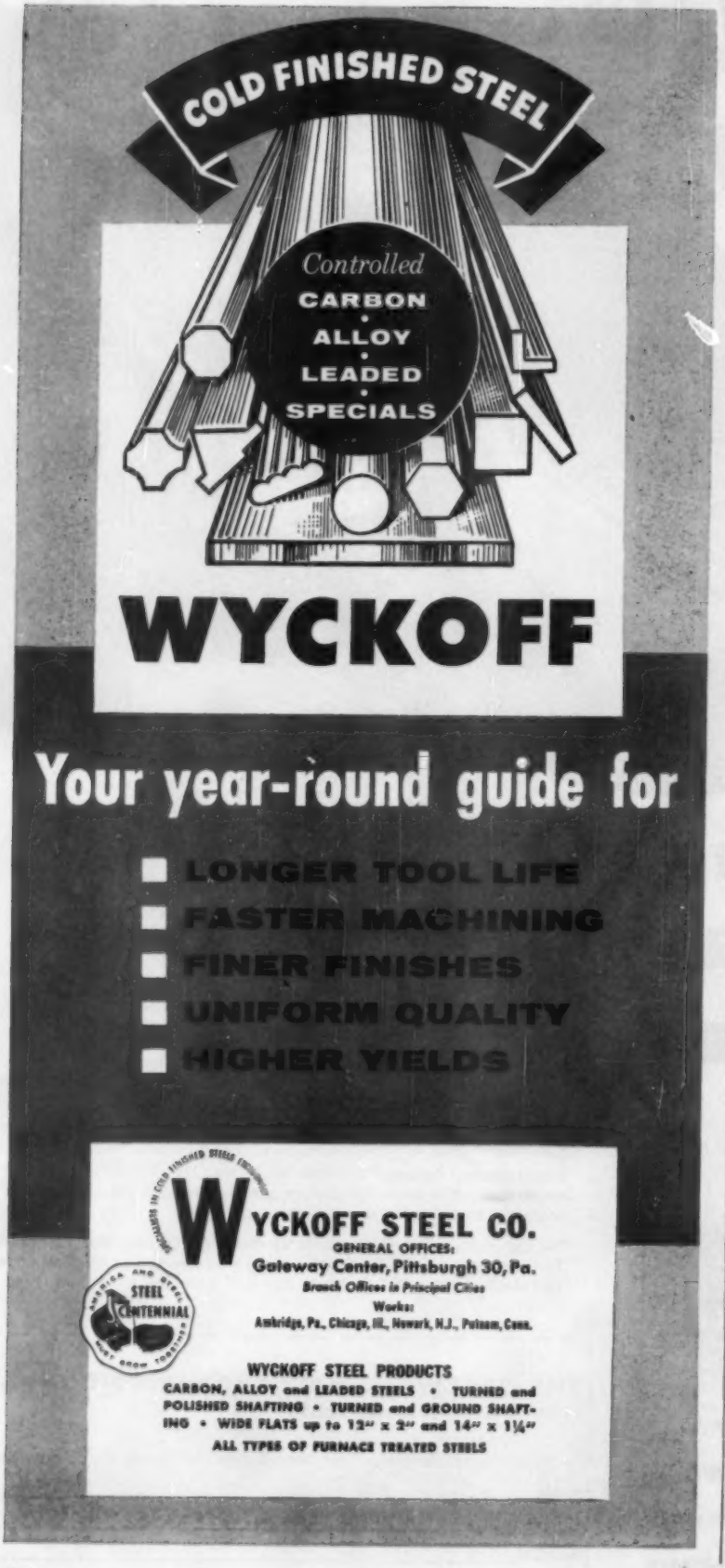

Names in the News . . .

Norman J Schaffer has been appointed works manager of the Forging and Screw Machine Division of Scovill Manufacturing Co, Waterbury, Conn. He moves up from the post of factory superintendent of the Division.

A R Giordano has been named operating manager of the Chrysler Delaware Defense Plant at Newark, Del. He was formerly factory manager of the Delaware Tank Plant.

Louis R Wanner has been named to the newly created post of manufacturing manager in charge of plastics, metal base, assembly and formatic operations for Sylvania Electric Products Inc, Warren, Penna. He has been serving as plant manager of plastics operations.

J Martin Stokes, manager of the Carbide Sales Division of Firth Sterling Inc, Pittsburgh, has been promoted to assistant to the vice president, sales. **Carl C Krogh,** assistant manager of the Division, succeeds Mr Stokes.

Frederick D Fernsler has been named manager of the newly formed nut department in the Aircraft Division of Standard Pressed Steel Co, Jenkintown, Penna. Mr Fernsler formerly managed the company's Unbrako inside sales department.

John Pamperin, factory manager of Beckman Instruments' Helipot Division, Newport Beach, Calif, has been named manufacturing director.

O W Carrico has been appointed general manager of the Automotive Division of Rheem Manufacturing Co at Fullerton, Calif. Formerly operations manager of the Division, he succeeds **F G Fisher** who has resigned.

Julius M Wilensky, production manager at Yale & Towne's Stamford (Conn) plant, has been appointed director of purchasing for the Yale Lock and Hardware Division. **John J Gell,** foundry manager at the Stamford plant, has been named assistant to the Division general manager of manufacturing. **George E Eike,** chief process engineer at Stamford, succeeds Mr Wilensky.

Ralph M Smith, superintendent of Timken Roller Bearing Co's Zanesville (Ohio) plant, has been appoint-

ed plant manager. He replaces **Elmer J Schweitzer,** recently made managing director of Australian Timken, Ltd.

Alfred F Duttweiler, Jr, has been named plant manager of Hoover Ball & Bearing Co's Universal Die-Casting Division, Saline, Mich.

Norman Roberson has been promoted from general superintendent in charge of plant production to production manager of Pacific Coast Engineering Co, Alameda, Calif.

Walter J Reeves, general sales manager of Electra Motors Inc, Los Angeles manufacturer of Electra-Gearmotors and related products, has been elected vice president, sales.

Arch C Shafer has been named general sales manager of Benchmaster Manufacturing Co, Gardena, Calif, maker of small punch presses and milling machines. Prior to joining the company Mr Shafer was sales manager for Cold Metal Products Co.

Milford H Luttrell has been named general sales manager of the Walworth Co; he moves up from the post of manager of the Southeastern Division.

Paul M Hafer, superintendent of Federal Pacific Electric Co's Cleveland manufacturing plant, has been promoted to plant manager.

Carl O Larson has been named superintendent of the Machine Division of Moore Special Tool Co, Bridgeport, Conn. Formerly chief inspector in the Division, he succeeds **Hadar Wahlquist,** who is retiring.

Edward G Merk, former vice president, sales, for Benchmaster Corp, has joined the Diamond Machine Tool Corp, Pico, Calif, manufacturer of the Multi-Max punch press. He will serve as sales manager.

George Bennethum has been named assistant manager of alloy steel sales for the Carpenter Steel Co, Reading, Penna. He is succeeded as assistant manager of tool steel sales by **T Allen Washburn,** former sales representative in the Indianapolis territory.

Bennett D Jones, manager of product development for Standard Pressed Steel Co, Jenkintown, Penna, has been advanced to the new post of technical director in the company's Aircraft Division. He will coordinate activities with the needs of the aircraft and missiles industries.

New automatic bandsaw **cuts off metal up to 24" x 24" cross-section faster at lower cost than ever before possible.**

Pushing Buttons for Better Living

The man in the picture above is earning himself a high standard of living with a modern push-button "tool." He is sawing off solid steel blanks for gears that will go into a metal forming press. The press will turn out parts for pop-up toasters—which the saw operator's wife can readily afford to buy.

Here, in action, we see the fundamental of the American economic system. The better our tools, the better, more abundant and lower priced the products they turn out.

During the past 10 years, new tools have increased individual productivity nearly 20%. But it isn't enough. Not with our population growing faster than the working force. Not with wages and costs rising faster than productivity.

Industry needs more and better equipment than ever before . . . like the new DoALL push-button Power Saw illustrated. This machine cuts off bars, rounds, billets, extrusions, pipe, tubing and structural shapes up to 24" x 24" cross-section—faster, at lower cost than any previous machine.

The Power Saw employs a new continuous-cutting saw band made of high speed steel which can be driven through the toughest metals at new faster rates. And, less of the valuable metal turns into "saw dust," because the cut is one half as wide as that left by other saws.

Pop-up toasters are dependable and moderately priced, thanks to the investment by industry in constantly improved tools.

This revolutionary new tool substantially reduces the cost of goods. Since the first step in manufacturing metal products is often a "cut-off" operation, manufacturers are invited to investigate its great savings possibilities.

Reprints of this series on economics available for your employees.

Manufacturers seeking ways to combat rising costs will also find much of interest in the 1500 DoALL machine tool, cutting tool, gaging and supply items. Call DoALL locally or write.

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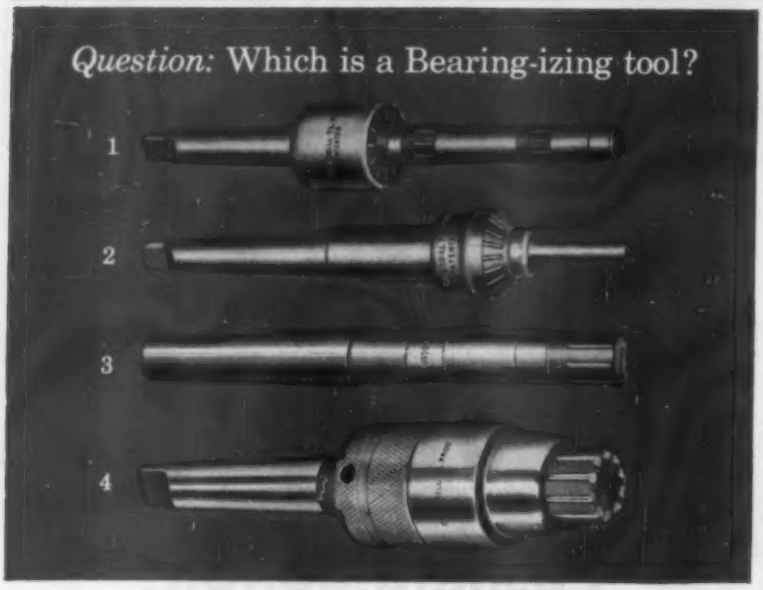
Question: Which is a Bearing-izing tool?



Answer: All four are Bearing-izing Tools! *

Remember . . . COGSDILL BEARING-IZING TOOLS are engineered for each application to meet your requirements. As no two problems are exactly alike . . . also no two Cogsdill Bearing-izing designs are exactly alike. Our experienced Engineering Staff design the tool for finishing bores, thrust faces and some contours to less than 10 RMS with accuracy to low tenths, to meet your special problems.

* 1 Flat surfaces & multiple diameters. 2 Angular valve seats. 3 Bottoming within .015. 4 Blind or shouldered holes.

Send your part print for our recommendation

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American Machinist's Special Report Number 410 outlines the plastics most widely used; the new materials now available; and the new toolmaking techniques that are being developed. Case histories illustrate current applications of these methods in Metalworking. Send 25¢ and your name and address to:

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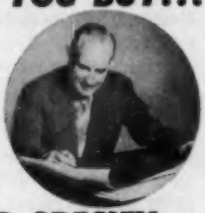

OR SPECIFY...

This Unit Is The Answer To

- *production waste*
- *design problems*
- *fire risk*
- *excessive repair bills*

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AUTOMATIC LUBRICATION

Automatic lubrication is one thing that designers, plant engineers and production men insist on these days —for their own machinery . . . and the equipment they manufacture. And careful purchasers make sure the automatic lubrication systems they buy are *Bijur Systems.*

For nothing protects like Bijur. Bijur Systems save production time and repair bills . . . reduce down-time and fire risk . . . lengthen machine life . . . and eliminate product spoilage due to over-lubrication. Bearings are never thirsty for oil, never flooded.

That's why it's just good business to have a custom-engineered Bijur System on the equipment you own, and *design* one into the equipment you manufacture. Installation is easy, cost is minimal, savings are substantial. Write today for *all* the facts about Bijur Systems!

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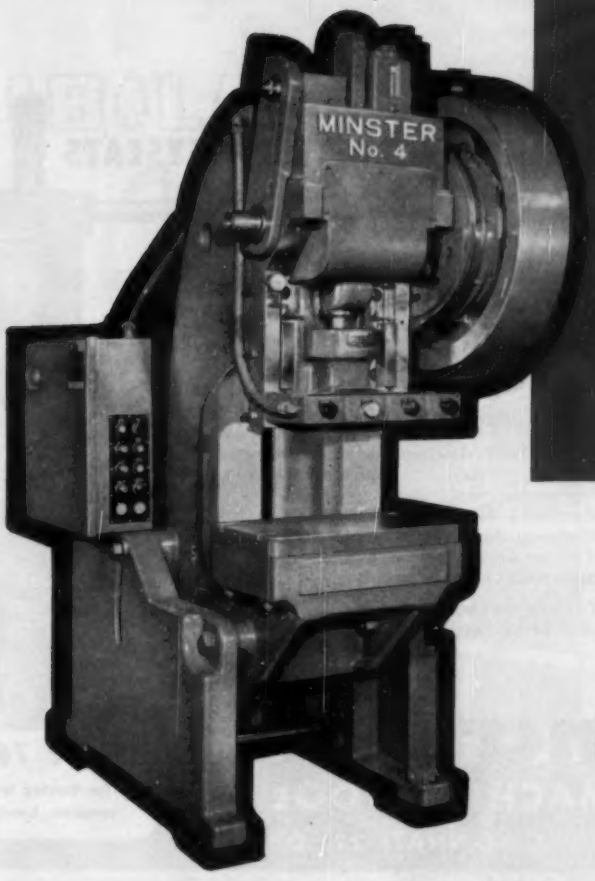


You Helped Design
The Improved

MINSTER O.B.I.

You, as a press user, have often told us what features *you* wanted in an O.B.I. to improve *your* press operations. Most of the design changes in this improved Minster O.B.I. are based on *your* ideas, desires and demands.

CENTRALIZED CONTROL CABINET CONVENIENTLY LOCATED . . . NEVER INCLINES

For convenience and better operation, control cabinet mounted on leg remains vertical when press is inclined; is subject to less operational shock and easier to maintain.

NEW LEG DESIGN PROVIDES MORE WORKING SPACE

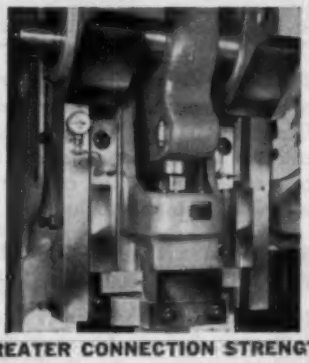
Square-cut legs give operator more room, a comfortable position in front of press. Inclining mechanism in leg and use of movable spacer rod provide more free space under press for tote pans or conveyors.

NUMBER	4	5	6
TONS CAPACITY	32	45	60

Flywheel or geared type. Drive can be mounted on either side. MINSTER patented Combination Air Friction Clutch and Brake Unit mounted within flywheel or drive gear on crankshaft.

HEAVIER FRAME FOR GREATER RIGIDITY, ACCURACY AND DIE LIFE

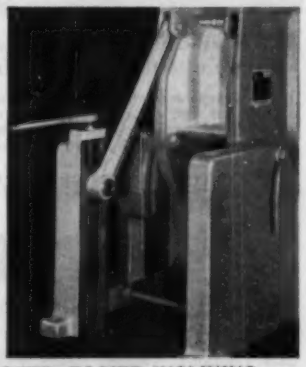
Frame closed in on top and front completely encloses bearing caps, thus providing better distribution of work forces. Connection cover keeps press cleaner—no oil drops hit operator.



GREATER CONNECTION STRENGTH —IMPROVED KNOCKOUT

Tail stock type connection screw locking. Increased connection strength and screw support.

T-Slotted Knockout blocks moving against frame surface give more positive knockout, are easier to adjust. No more bracket breakage.

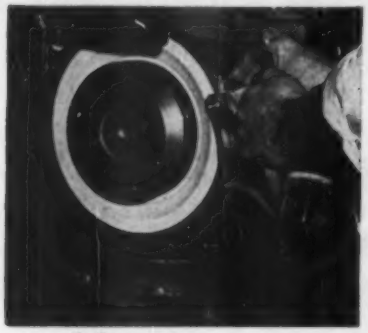


FASTER, EASIER INCLINING

Inclining the press takes less time and labor with ratchet-wrench-operated mechanism located in press leg *at normal working height*. Die changes are made quickly in vertical position with greater safety, more accurate alignment and less die change-over time.

THE MINSTER MACHINE COMPANY • MINSTER, OHIO

problem: stop dust from causing health and morale problems.



problem: prevent dust from damaging costly precision machines.

answer: trap dust at its source with *unitized* Torit Dust Collectors.

Your workers are important . . . good personnel are becoming increasingly scarce. Portable, self-contained Torit units keep your employees healthy, satisfied and productive by collecting irritating dust. They protect your precision machines too—reduce costly maintenance and "down time." Many models and sizes available.

Free facts on dust problems and dust control. New 28 page, illustrated handbook is full of important, money-saving data. Contains charts, applications, details and specifications on all Torit equipment. Write today.

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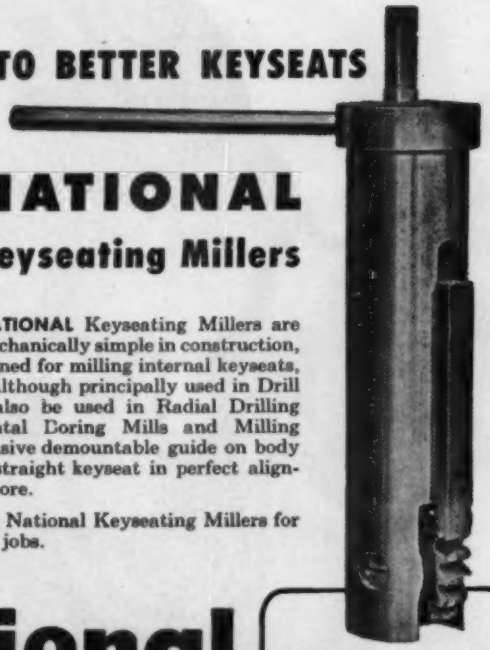

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NATIONAL Keyseating Millers are mechanically simple in construction, sturdily built, designed for milling internal keyseats, faster and better. Although principally used in Drill Presses they can also be used in Radial Drilling Machines, Horizontal Boring Mills and Milling Machines. An exclusive demountable guide on body of Miller assures a straight keyseat in perfect alignment with axis of bore.

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GO MODERN

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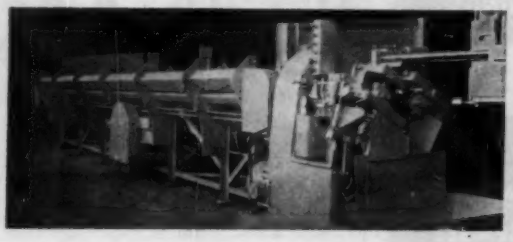
Provided she works hard enough
With a rusty cutting-off machine.



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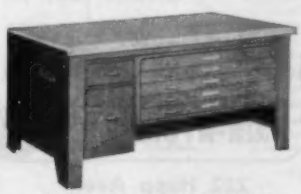

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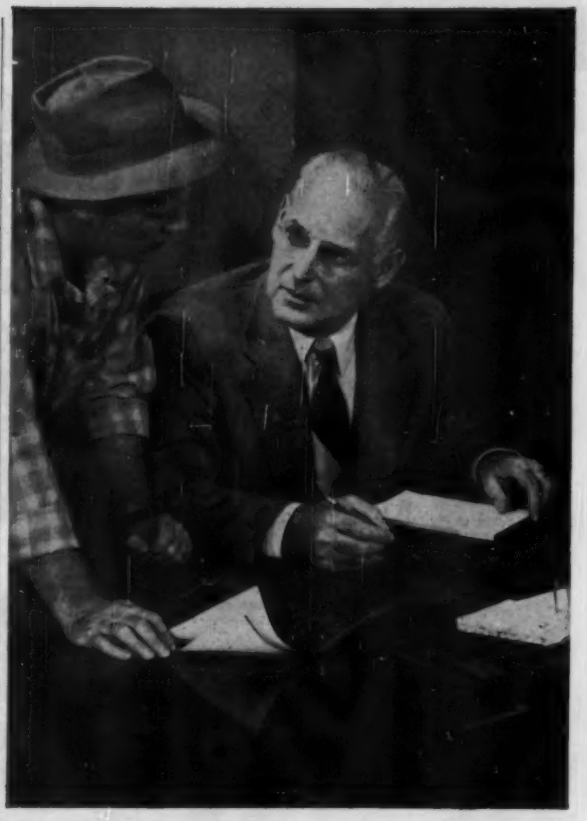

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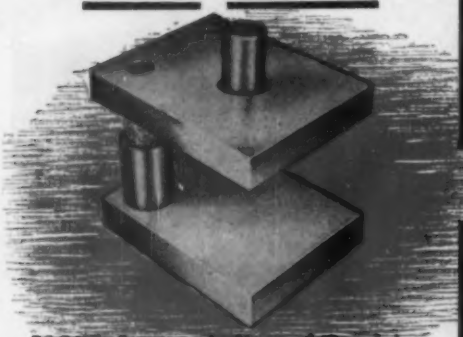

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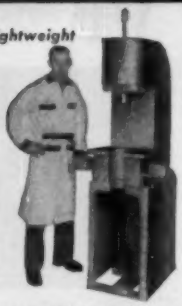

Model C-500. A versatile press with 8¼ inch throat, 6 inch stroke, 2 inch adjustment, equalized pressure full length whether feather-touch or full blow. 100 pound air line gets up to 21 tons delivery. Stand or bench installation. Moving parts protected in handsome housing. Adjustable speeds. Hand, foot or automatic controls. Simple, tireless and safe operation. Women like it. Long, trouble-free service. Easy to maintain and repair. For all kinds of materials. Thickness no problem. Rivets, flanges, broaches, stakes, crimps. Many other uses.

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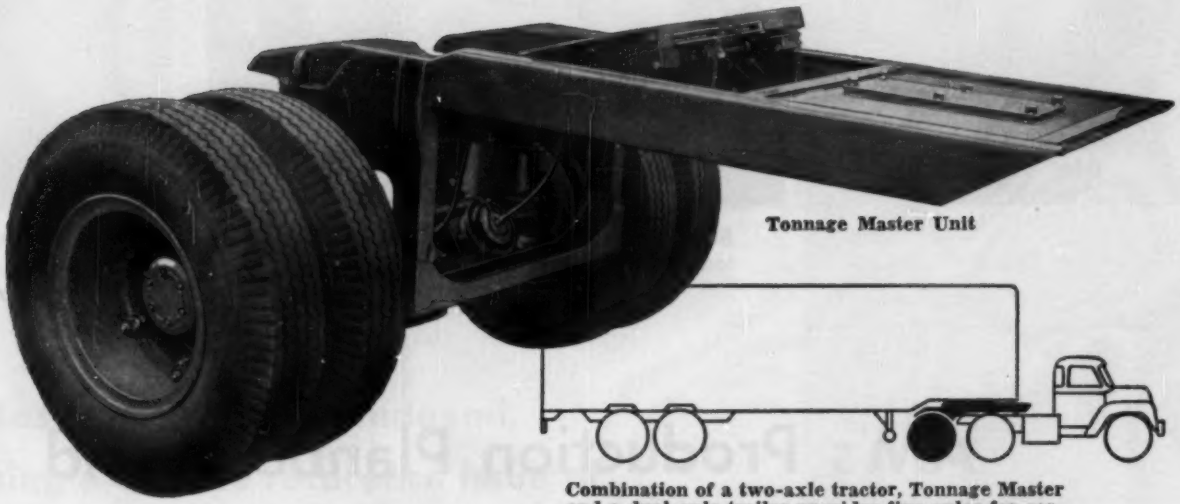

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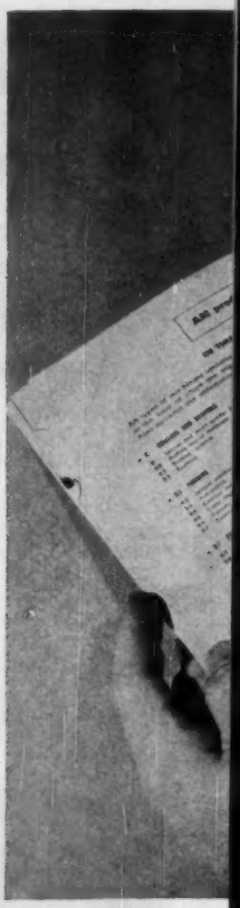

Buyers' Guide—Section J—contains 107 pages of sources of supply, classified by product.

AM's Production Planbook and Buyers' Guide Issue

NEW YORK—Your copy of American Machinist's 1958 Production Planbook and Buyers' Guide Issue—to be published Mid-September, 1957—will contain nearly 2,000 successful, useable Metalworking production "Nuggets"—core ideas extracted from articles published in regular issues of American Machinist—plus a complete, authoritative Buyers' Guide section listing sources of supply for everything from A to Z.

American Machinist issue dates and page numbers in which the original material was published are included if you wish to refer to the full text. In many instances the drawings, diagrams, charts or photos are republished in the Planbook issue.

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MACHINING **B**

TOOLING **C**

PRESSWORKING, MOLDING, CASTING **D**

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ASSEMBLY, HEAT-TREAT, FINISHING, (ASSEMBLY INCLUDES WELDING & PORTABLE TOOLS) **F**

MATERIALS, COMPONENTS **G**

MATERIALS HANDLING, SERVICES **H**

PRIZE IDEAS, REBUILT EQUIPMENT **I**

BUYERS' GUIDE **J**

PORTAGE *Announces...the*

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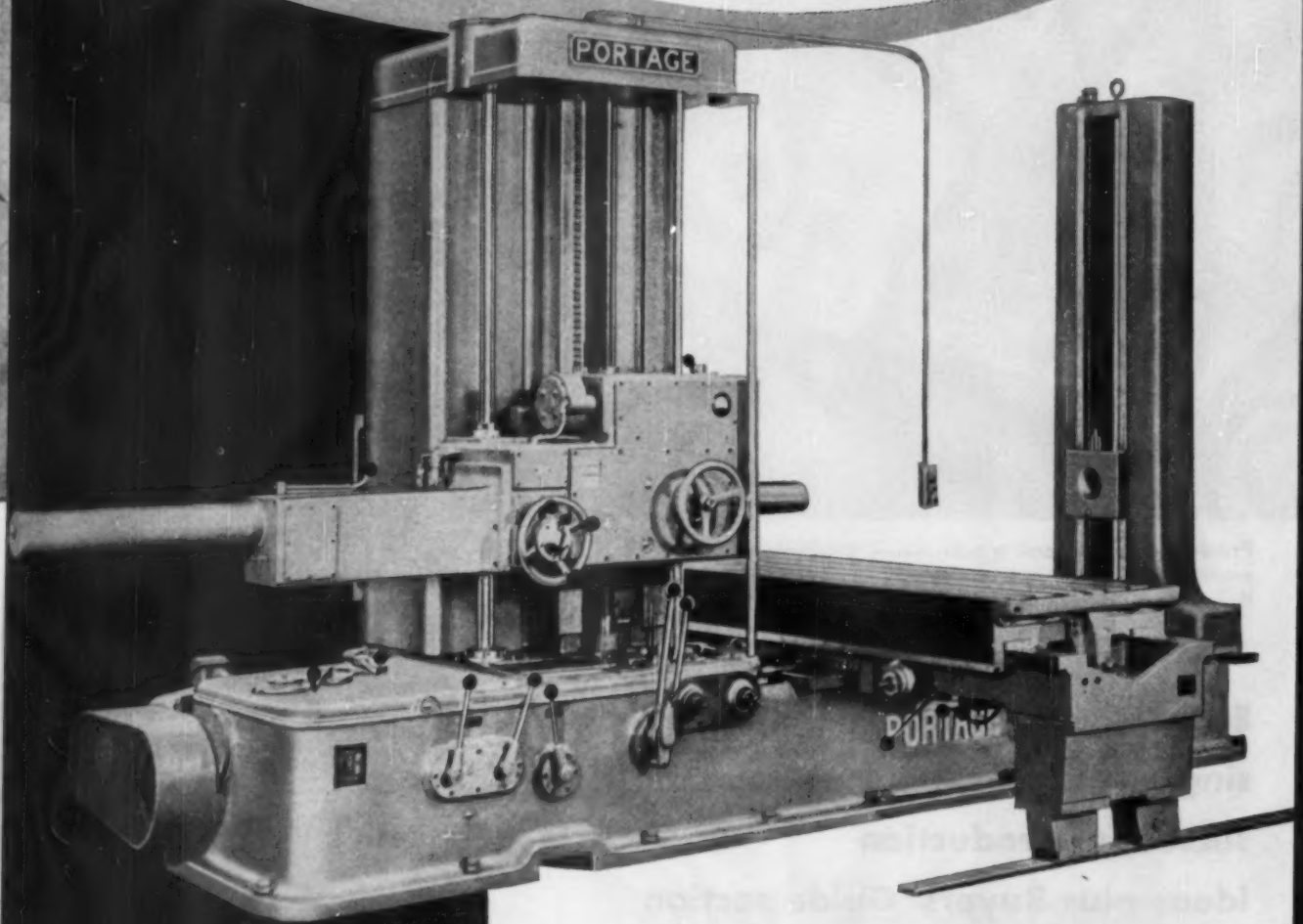

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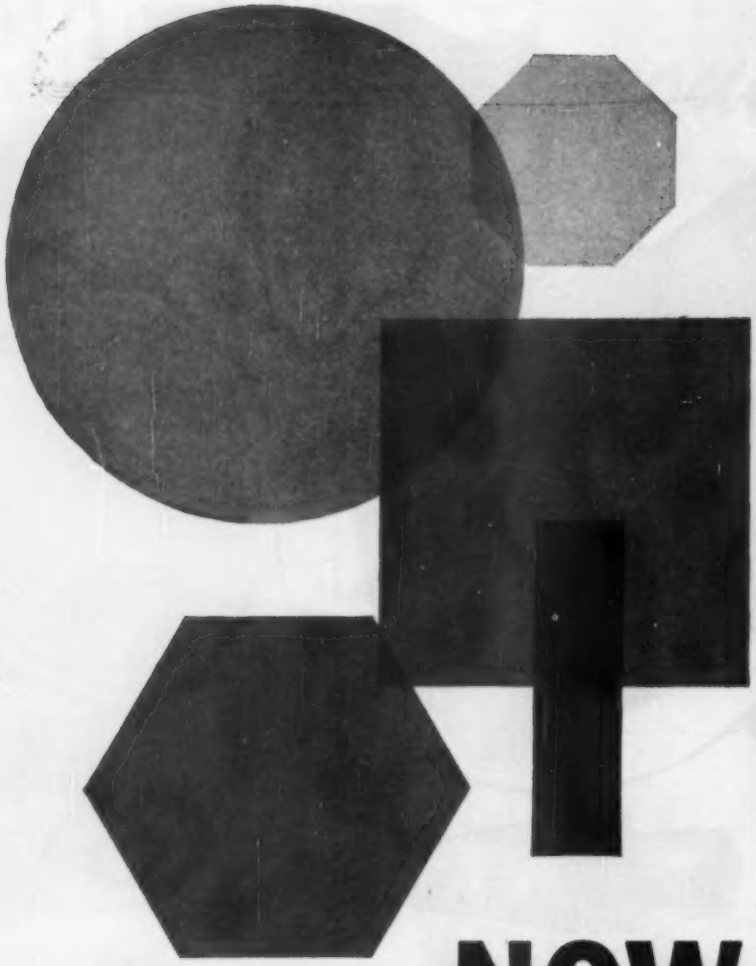

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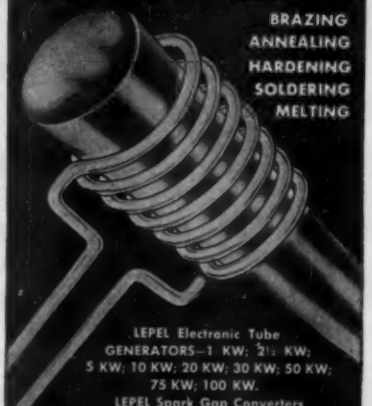

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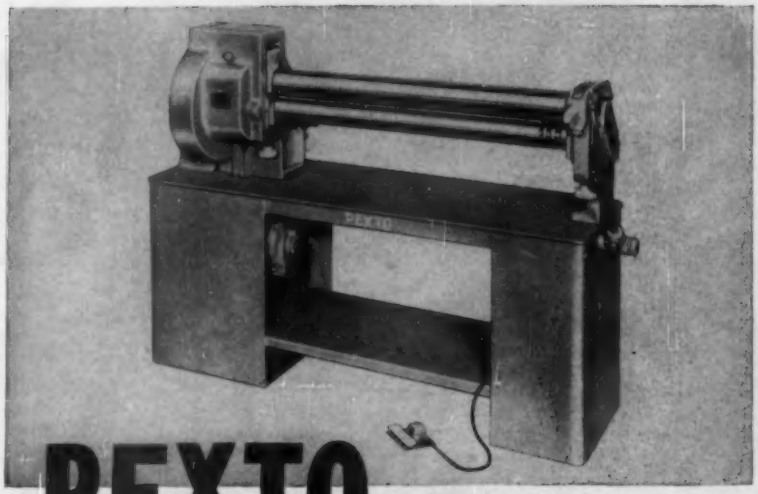

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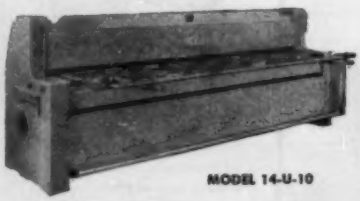

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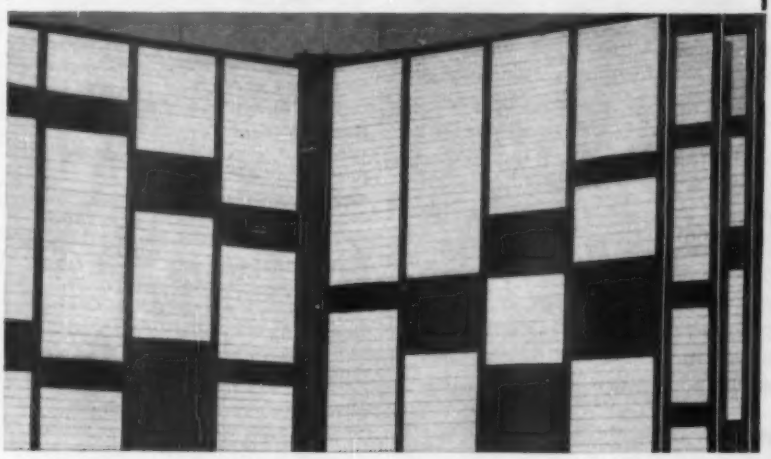

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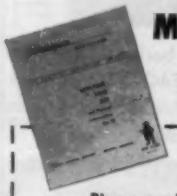

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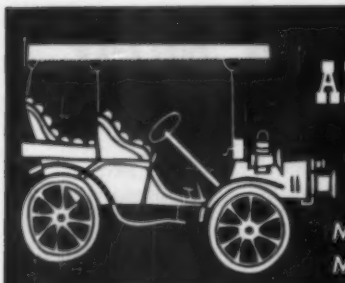

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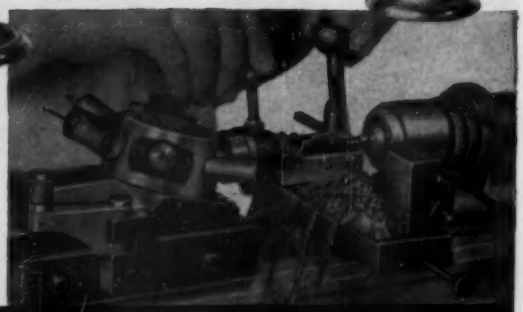

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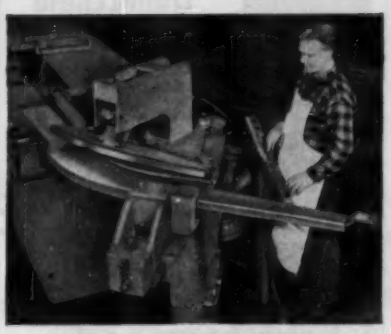

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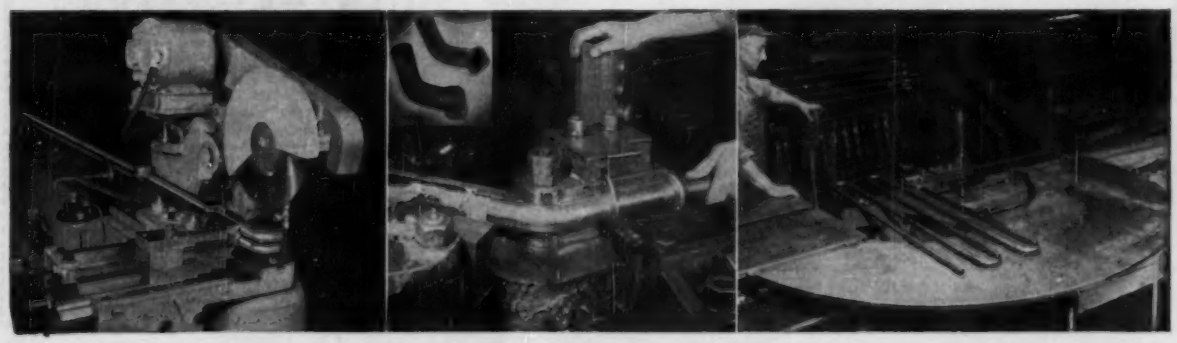

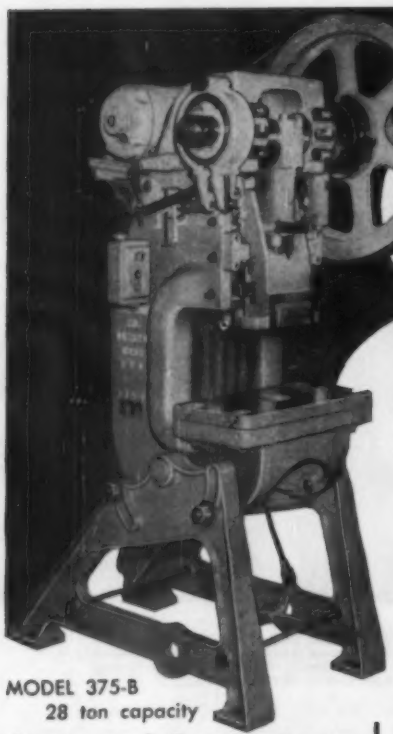

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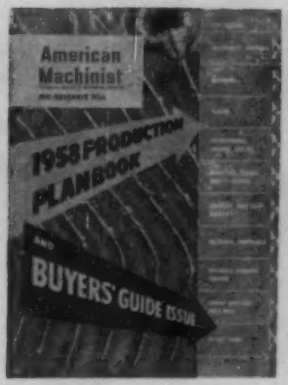

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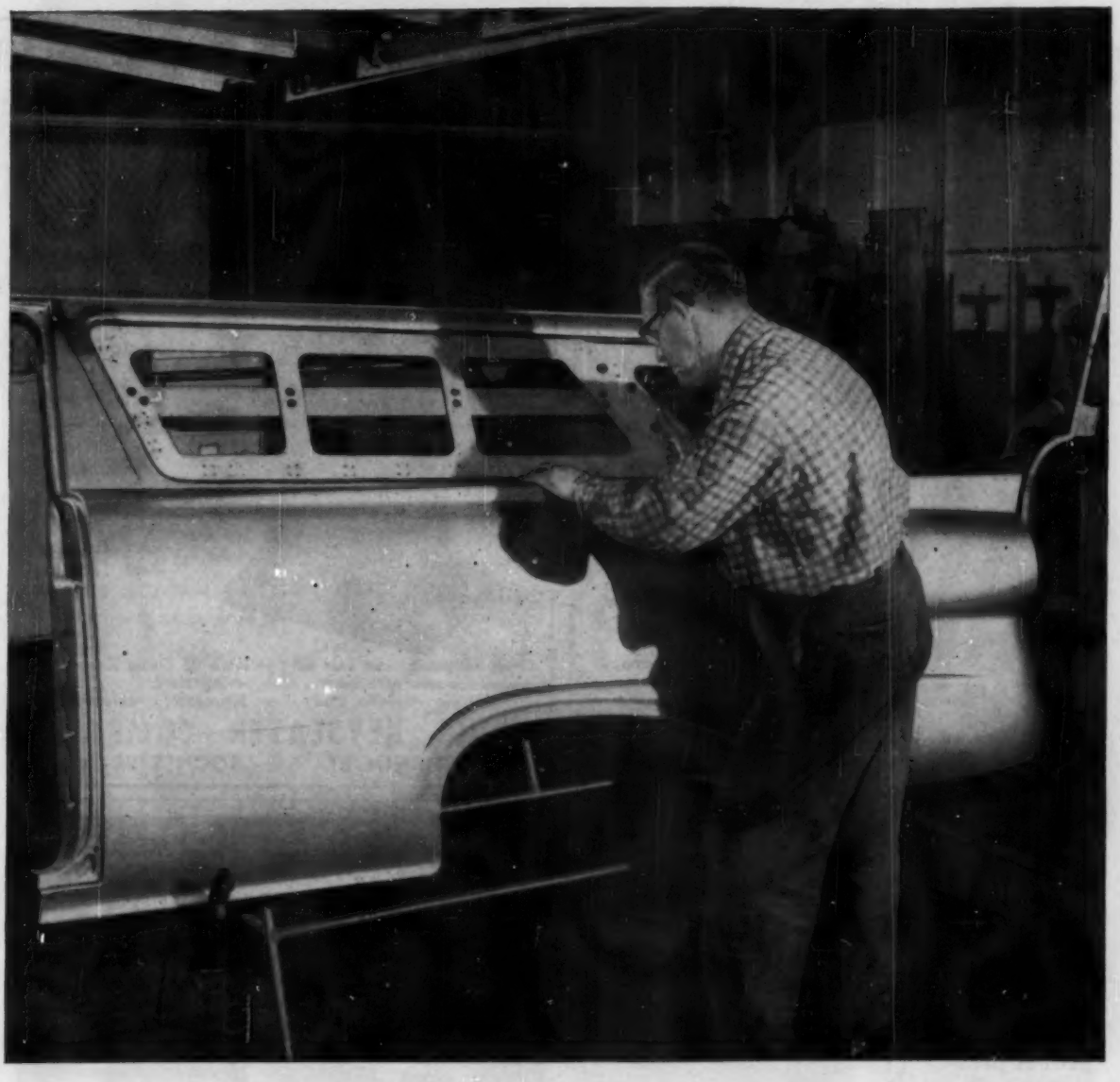

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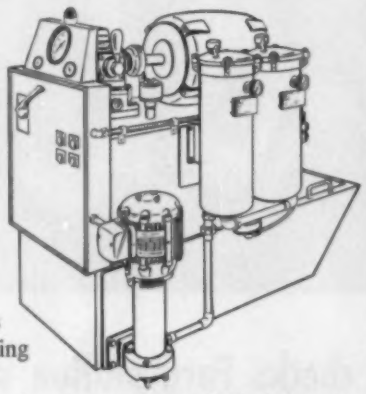

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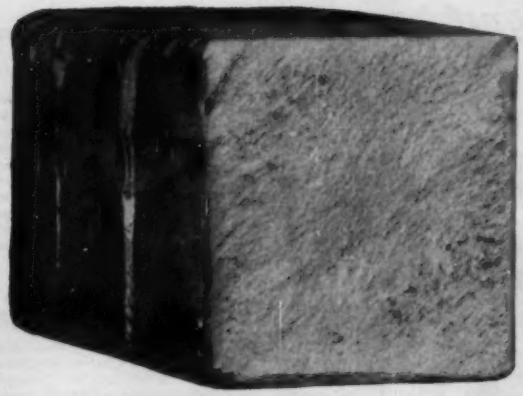

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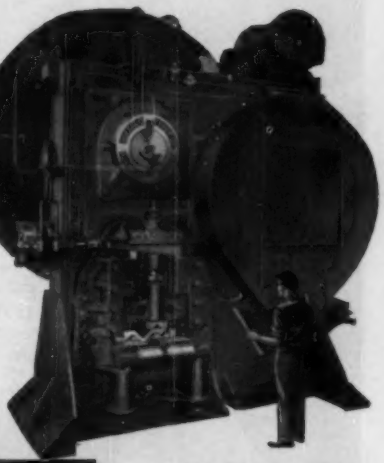
**The "Q" Factor—the built-in Quality which provides trouble-free satisfaction and long life.*



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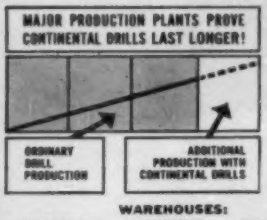
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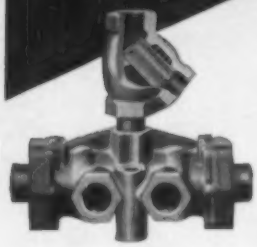

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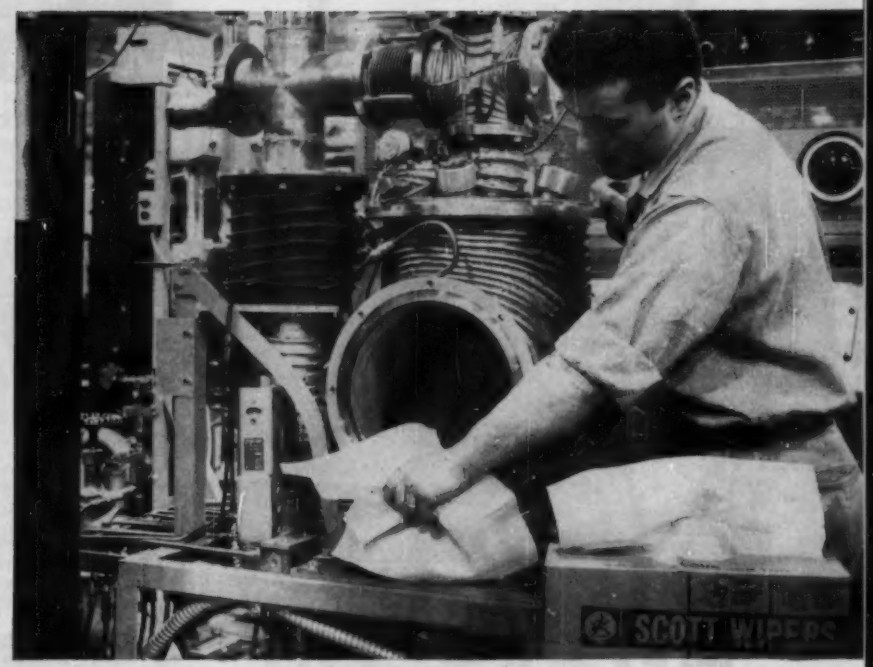

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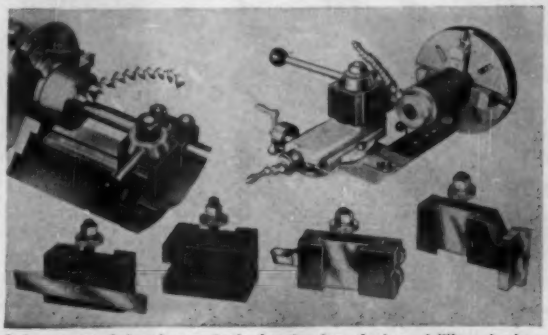

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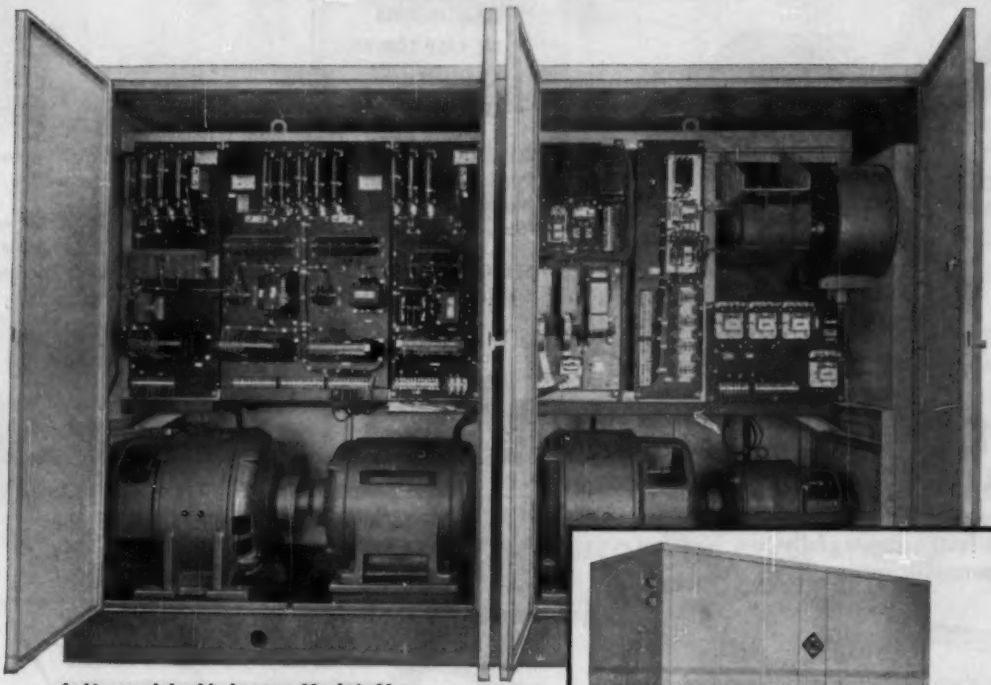

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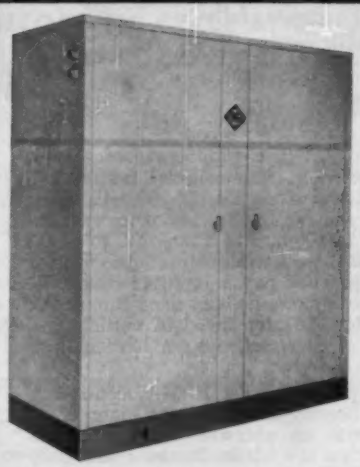

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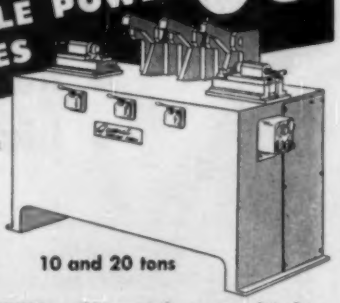

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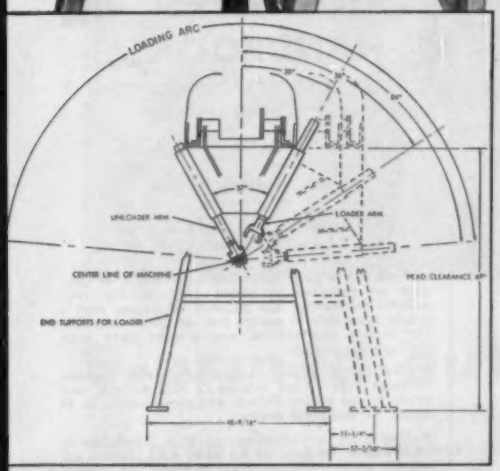

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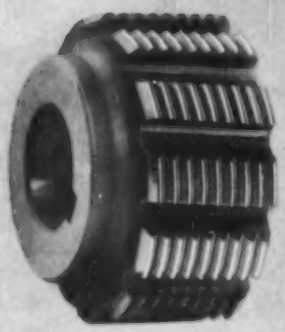

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City ..... Zone ..... State .....

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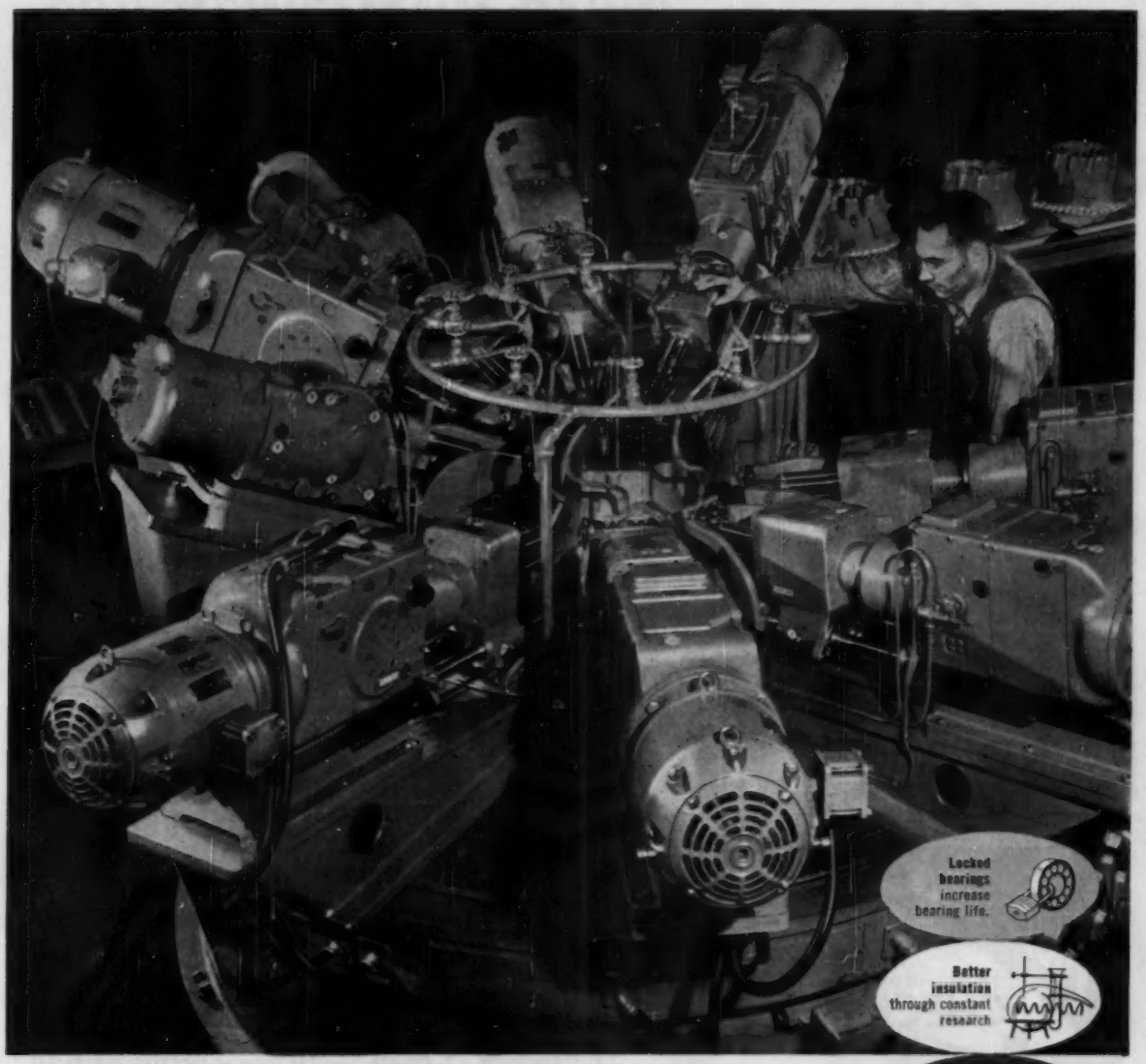
Position FA-8-12-57

This offer applies to U. S. only.



9-armed automation

Tailored for precision metal-working, Louis Allis motors help speed production

You've got to have motors that can take the tough duty cycles required by multiple-purpose, automatic machine tools, such as the machine pictured above.

You'll be wise to specify Louis Allis motors on your machine tools, where they can boost your production.

Louis Allis special motors can be matched to your metalworking operations to provide high torque, quick acceleration, fast stops, and rapid reversal — in almost any sequence to match your duty cycle.

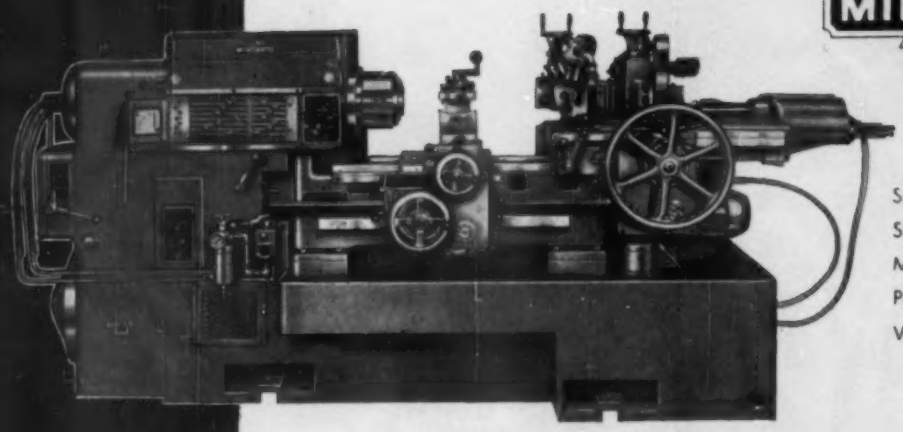
Need help? Well, don't wrestle with your drive problem alone. There's a Louis Allis sales engineer, expert on machine tool and metal working motor applications, who'll gladly help you.

Contact your Louis Allis District Office or write to The Louis Allis Company, 452 East Stewart Street, Milwaukee 1, Wisconsin.

LOUIS ALLIS

MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVES

50 E



MINGANTI
BOLOGNA

Spindle bore	2 1/4"
Swing	18"
Max speed	rpm 3000
Power	HP 8
Weight	lbs. 6000

AUTOMATIC
"CAMLESS"
TURRET LATHE

GIUSEPPE MINGANTI & C.
BOLOGNA (Italy)

Exclusive Distributors for the U.S.A.: Sales Service Parts
The Melborn Company, 18015 Reed Ave., Melvindale, Mich., U.S.A.

Wolverine
TOGGLE CLAMPS
CHECK THESE FEATURES ON YOUR PRESENT TOGGLE CLAMPS

- Drop Forged Arms for maximum strength
- Heavy Body section for easier welding
- Case Hardened Bushings and Pins for better wear
- Flush Riveted Pins for more thrust bearing
- Black Oxide Finish for rust resistance without weld interference

SINCE 1926

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WOLVERINE TOGGLE CLAMPS

Also available in several types and sizes of Standard Action and Push Action Units.

CQ-1100 SERIES

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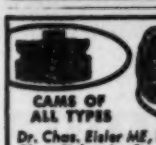
WOLVERINE TOOL CO.
1484 E. WOODBRIDGE • DETROIT 7, MICH.

TANNEWITZ
VARIABLE SPEED TOOL ROOM BAND SAWS AND HIGH SPEED METAL CUTTING BAND SAWS . . . SINGLE OR VARIABLE . . . 50 TO 15,000 FPM. PRODUCT OF MORE THAN 50 YEARS OF SPECIALIZATION. Write or phone.
The TANNEWITZ WORKS Grand Rapids, Michigan



A SPECIALIZED CAM MILLING SERVICE
Over 100 Types of INDEXING TURNTABLES
Also Geneva Gears, Spot and Butt Welding, Positioners for Brazing, Spraying, Welding and Soldering
CAMS OF ALL TYPES
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Contract production; Special automatic machines
EISLER ENGINEERING CO., INC.

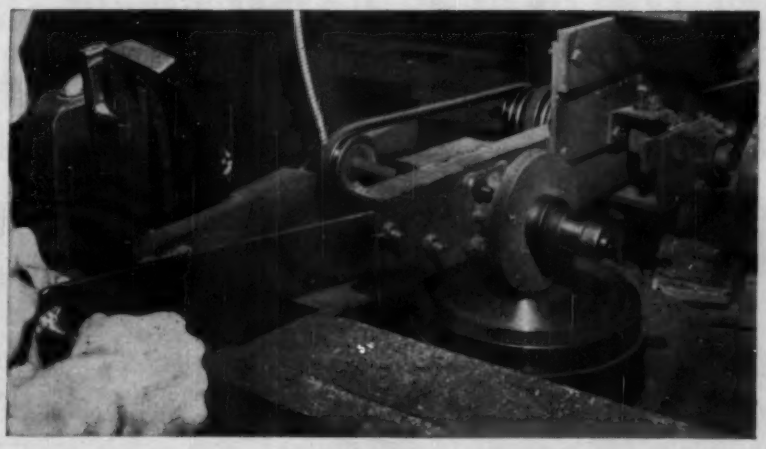
SHORE SCLEROSCOPE
HARDNESS TESTERS
Pioneer American Standard
SINCE 1907
Available in Model C-2 direct reading or in Model D dial indicating with equivalent Brinell and Rockwell C Hardness Numbers. May be used free hand or mounted on bench clamp. Sensitive over entire range from softest to hardest of metals without adjustment. Non-injurious to work.
OVER 40,000 IN USE
THE SHORE INSTRUMENT & MFG. CO., INC.
90-35B Van Wyck Exp.
Jamaica 35, N. Y.

MODEL D

MODEL C-2

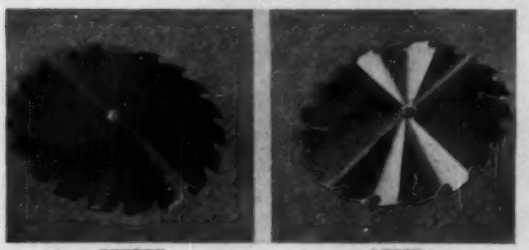
FOR HEINEMANN SAWS—

how HEINEMANN does it!



Saw blades are taken rough ground from surface grinders. They are placed on the magnetic rotating plate. The Brightboy Wheel oscillates back and forth across the surface of the saw.

"a mirror-like BRIGHTBOY Finish, unobtainable by any other form of polishing"



BEFORE AFTER

Heinemann Saw before and after Brightboy polish

The FINISHING Touch!

"The eye-appeal provided by Brightboy's unique working action unquestionably plays an important part in the sale of our saws", says Mr. William Heinemann of the nationally-known Heinemann Saw Corporation, Canton, Ohio. "It produces the superb finish we demand to reflect the high skill of our craftsmen and our use of the finest materials which assure outstanding service and satisfaction".

For Manufacture & Maintenance of Tools

A Single-Step BURRING, CLEANING, FINISHING, POLISHING OPERATION

The ABRASIVE and RUBBER in Brightboy work together in a simultaneous action which achieves this time saving, 4-in-1 operation. Stock Brightboy numbers are matchmated to any type of tool and steel; to any requirement of finishing. A Brightboy finish frequently constitutes the final polish.

Readily Available: A WIDE RANGE OF STOCK SHAPES, SIZES & TEXTURES

Brightboy is made in wheels, sticks, rods and blocks for machine and manual operations. It works to contours. Available in many Silicon Carbide and Aluminum Oxide grains from extra fine to extra coarse—all in soft, firm and tough rubber binders.

Brightboy's practically limitless applications and finishing effects give you a completely new, time-saving concept of abrasive uses. Ask your dealer for recommendations and for the Brightboy catalog listing grains and textures, applications, machine speeds. Write us if he cannot supply you or on any problem in which finishing is involved.

WELDON ROBERTS
Brightboy
RUBBER CUSHIONED ABRASIVES

BRIGHTBOY INDUSTRIAL DIVISION
WELDON ROBERTS RUBBER CO.
95 North 13th Street Newark 7, N. J.
America's Pioneer Manufacturer of Rubber-Bonded Abrasives

Inland Ledloy*...the original leaded steels

Nearly twenty years ago, Inland started a metalworking revolution with its discovery of how to add lead to steel. The first experimental heat and the first production heat of leaded steels were made in Inland furnaces. Since then, by unending probing, refining, and perfecting, Inland has learned the secrets of making fine leaded steels. Today, Inland, the largest producer of leaded steels, sets the standards with which all other free machining steels are compared.

These Inland Quality Control men are checking the results of a "sweat-test." Samples of billets of Ledloy are baked in an electric oven. Then, the minute drops of lead which rise to the surface are checked for uniformity of size and dispersion. Billets that do not meet Inland's rigid standards are rejected. It is one of many controls Inland uses to make certain your Ledloy is the finest leaded steel made.

Because of Inland's long history in making leaded steels, technicians like these know . . . *by experience* . . . that your Ledloy will be right. Inland standards, worked out through many years, are your assurance that the Ledloy represented by these samples will be another shipment of the world's most machinable steels.

Experience makes Inland Ledloy better

INLAND LEDLOY is sold in cold drawn form, under various trade names, by leading cold drawers and steel warehouses from coast to coast.

INLAND STEEL COMPANY *38 South Dearborn Street • Chicago, Illinois Sales Offices: Chicago, Milwaukee, St. Paul, Davenport, St. Louis, Kansas City, Indianapolis, Detroit, New York • *registered trade name of Inland Steel Company, pioneer in the development of leaded steels.*

Gaging . . .

the Surplus Machinery Market

• **Nearly 1000 machine tools,** value $10 million or so, have just been inspected at Chicago's O'Hare Air Force Base by a team of eight machine tool builders and distributors, used machinery dealers and government officials, headed by Harry Hawkins of BDSA's Metalworking Equipment Division.

There's a distinct possibility that more government-owned machines will be declared surplus this year, too. For details and significance of the government's stepped-up surplus machine tool disposal program see "Machine Tools," p000.

• **Believe it or not,** we've found a dealer who says business is "excellent, terrific, stupendous!" He's a Midwesterner who'd rather remain anonymous, because he's admittedly shading prices to suit current market conditions.

"You've got to measure the market against the real value of machine tools in inventory, and price them accordingly," he says, "I'm running a business, not a museum. I don't believe in holding a large inventory in expensive warehouse space—waiting for the market to improve."

"Trouble with many dealers," he claims, "is that they started their businesses during the war and they still look for high wartime profits. Instead, they ought to be unloading inventories at prices the present market will absorb—but still at a good profit margin. The surplus machinery dealer has to learn to roll with the market. I expect that 10% of the dealers in my area will be out of business by year's end, and 50% out on the street within two years. Why? Because they have their capital tied up in large inventories that they're holding in hopes of an improvement in sales. But buyers today are shopping around for the best deals."

Strong words. But maybe he has something there. Look at his record—sales to date this year at least 25% ahead of last year, 12 machines sold within 10 days.

• **Contrast this record with that of more conservative dealers,** here are some typical reports:

Dealer No. 1: "Business is worse than a month ago, practically nothing has moved for the last two months. I'm very pessimistic about the outlook for the rest of the year. Other dealers in my area are in the same boat, they tell me."

Dealer No. 2: "We're in the middle of the usual summer slump—most buyers must be on extended vacations. Sales total for the first six months was under that for the same period last year. But I think business will pick up in the fall."

Dealer No. 3: "Business has picked up a little in the last two weeks—mostly inquiries for older machines, which have been dead for months. I think it's because customers are getting very tired of hearing such high prices quoted on late models."

Dealer No. 4: "I don't agree that customers are going to fall back on old machines, although there is a lot of resistance to high prices for the good stuff. Shop people are leery of any machine built before World War II. It's a matter of education—it may be a good machine, but if it's that old, the customer just doesn't trust it."

Dealer No. 5: "We've noticed a slight pickup in recent weeks. Maybe it's because the finance companies are easing up a little with money. They're a little more cooperative now. But we ourselves are cutting down on machine buying. Why should we borrow money at crazy interest rates to buy a machine we can't sell?"

United
EVERY TIME!

FOSTER 4FU "FASTERMATIC"
Universal Automatic Chuckers
16 Spindle Speeds to 484 RPM
A-11" Spindle Nose, Air Chucking.
Lots of Tooling. 1941 to 1948

FOSTER 2FU "FASTERMATIC"
Universal Automatic Chucker
28 Spindle Speeds
A1-8" Spindle, Air Chucking

HEADERS
WATERBURY-FARREL #33 Open Die Double Stroke
WATERBURY-FARREL #22 Solid Die Double Stroke
WATERBURY-FARREL #22 Open Die Double Stroke

BOLT TRIMMERS
WATERBURY-FARREL #3—Hopper Feed
MANVILLE #375C—Hopper Feed
MANVILLE #4—Hopper Feed

NUT BLANKERS
WATERBURY-FARREL 3/8" Auto.—Stock Reel
WATERBURY-FARREL 1/2"—Auto.

THREAD ROLLERS
MANVILLE #375C Horiz. — Hopper Feed
WATERBURY-FARREL #30—Inclined Hopper Feed
WATERBURY-FARREL #20—Inclined Hopper Feed

GEAR EQUIPMENT
BARBER COLMAN Type S Hobber
BARBER COLMAN #3 Automatic Hob Sharpener
GLEASON 5" Straight Bevel Generator
GLEASON 6" Straight Bevel Generator
FELLOWS Ext. Spur & Helical Str. Line Generator
FELLOWS 4" Fine Pitch Ext. Spur & Helical Shaver
FELLOWS #61A Int. & Ext. Spur Shaper
FELLOWS 6M Red Liner Tester
FELLOWS #615A Int. & Ext. Spur & Helical Shaper

ENGINE LATHES
AMERICAN 12" x 30" High Duty 12-Sp.
BRADFORD 14" x 30" 12-Speed
PRATT & WHITNEY Model C 14" x 30" 18-Speed
MONARCH WAA 14" x 150" 16-Speed
NEBEL LN 18" x 30" 8-Speed
REED-PRENTICE Mod B 14" x 54" 16-Sp.

TURRET LATHES
B & O #2 1" Ram—Bar
B & O #7 2 1/2" Ram—Bar or Chucker
GISHOLT #3 Ram—Bar
JONES & LAMSON #5 Ram—Chucker
W & S #2 1" Ram—El. Bar Feed
W & S #3 1 1/2" Ram—Chucker
W & S #5 2 1/2" Ram—Bar—Preselect

PLANERS
GRAY 36" x 36" x 12' Dbl. Housing—1 Rail, 2 Side Heads—1942

PLANER MILLER
INGERSOLL 42" x 42" x 14' Adj. Rail Dbl. Housing — Tubular Ways 2 Swivel Side, 2 Swivel Rail Heads

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Every Item Guaranteed as Represented

LATHES

24" x 12' BOYE & EMMES Grd. Head, Timken Bearing. Taper Attachment.

4 DE POTTER & JOHNSTON Automatic Turret Lathe, Late Type.

24", 36" BULLARD Vertical Turret Lathe, Turret Hd., Side Hd., M.D.

No. 2, 3, 4, 6 WARNER & SWASEY Univ. Turret Lathes, Bar Feed.

No. 3, No. 7 BARDONS & OLIVER Universal Turret Lathes, Preselector, Bar & Checking, Late.

No. 1L, 2L, 3L GISHOLT Univ. Turret Lathe, Cross Sliding Turret, M.D.

DRILLING MACHINES

28" BARNES Upright Drill Press No. 242 M.D. Box Column, Power Feed.

3', 5', 6' CINCINNATI-BICKFORD Radial.

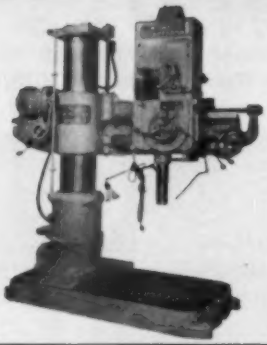
MILLS

No. 3 Cincinnati H5DT Vertical Mill 1944

No. 56-90 CINCINNATI Duplex Hydromatic Mill, Late Type.

No. 0-8 CINCINNATI Horizontal & Vertical Prod. Mills, M.D.

No. 34-36, 45-48, 48" Cincinnati Duplex Mills, Late Type.



3'x13" Cal. CINCI-BICKFORD "Super Service" Radial Drill. Motor on Arm.

No. 2HL KEARNEY & TRECKER Horiz. Mill, M.D., Late Type.

No. 2 BROWN & SHARPE Vert. Mill, Light Type. Swivel Head, M.D. Late.

No. 2, No. 3, 4 CINCINNATI H5DT Horiz. Mills, Vert. Heads Extra Table Travel, 1945.

No. 1-14 KENT-OWENS Hydraulic Prod. Mills M.D., Late Type.

No. 4 CINCINNATI Hi Power Vert. Mill, 1942.

PRESSES

No. 6 BLISS Straight Side Press Double Crank 135 Tons Cap., Motor Driven.

3W WATERBURY FARREL Hi-Speed Blanking, 60 Tons Cap., 1½" Stroke, Reeves Drive.

No. 18, 19, 20, 21 Bliss O.B.I. Press.

GRINDERS

28" x 12' centers, FARREL Traveling Table Type Roll Grinder, New in 1942. Excellent condition.

6" x 18" NORTON Hydraulic Horizontal Surface Grinder, Permanent Magnetic Chuck, Coolant System. Late Type.

6" x 10" x 48" NORTON Hyd. Horiz. Surf. Grinder, M.D.

4T SELLERS Tool Grinder, MD, Late Type.

30" INGERSOLL Face Mill Cutter Grinder, M.D. Late Type.

6" x 18" LANDIS Type "C" M.D. Hyd., Cylindrical Grinder, Serial #29196.

No. 5 BROWN & SHARPE Hyd. Surface Grinder 8" x 24"

MISCELLANEOUS

18 KW SCIENTIFIC ELECTRIC Induction Heater, Tube Type.

No. 13 BROWN & SHARPE Univ. Tool & Cutter Grinder, Late Type.

No. 175 SCHMIDT M.D. Hyd. Power Marking Machine, Late Type.

No. 3, 5 MITTS & MERRILL, No. 5 Davis Keyseaters, M.D.

No. 194 BARNES Vertical Hone, 4" Capacity, 12" Stroke, M.D.

20" ROCKFORD Model SA Hydraulic Vertical Slotter, New 1953.

9" CLEVELAND Model A Automatic Screw Machine. Late Type.

No. 9 MARVEL Heavy-Duty Hack Saw 10" x 10" Cap. M.D. Late Type.

6" x 10 ga. Parker Power Squaring Shear, M.D. Late Type.

OVER 1000 MACHINE TOOLS AVAILABLE IN STOCK . . . SEND US YOUR INQUIRIES

Eastern Rebuilt Machine Tools

THE SIGN OF QUALITY—THE MARK OF DEPENDABILITY

CYLINDER GRINDERS

No. 73 Heald Airplane Cylinder Grinder, m.d., new
Model FG Micro Cylinder Grinder, m.d.
No. 50 Heald, m.d., 1944

DISC GRINDERS

No. 151 Besly, m.d.
No. 4 Gardner Disc Grinder, m.d.
7½ H.P. U.S. Elec. Tool Co., m.d., new
14A Gardner, m.d.
No. 10S—30" cap. Gardner, m.d., latest
No. 121 Hanchett Prod. Face Grinder, m.d.
No. 124 Mattison Auto. Stroke Grinding & Polishing Machine, m.d.

SURFACE GRINDERS

No. 10 Blanchard Rotary, m.d.
No. 18A-2 Blanchard Auto. Rotary, m.d.
No. 33 Abrasive, m.d.
14" Pratt & Whitney Vertical, m.d.
14" Pratt & Whitney Model M 1646 Vertical, m.d.
No. A-1—8" Arter Surface Grinder
No. 22—12" Heald Rotary, m.d.
No. 25-A—24" Heald Rotary, m.d.
No. 25-A—30" Heald Rotary, m.d.
No. 2 Brown & Sharpe, m.d.
#300-80 Hanchett Vertical Spindle, m.d.
72" Type NT Rogers Knife Grinder, m.d.
18" wide, 24" under wheel, 120" table Mattison, m.d.
Model F, 6x10x18" Thompson Hydraulic Horizontal Wheel, m.d.
Model 84A—61" Bridgeport Hydraulic Face, m.d.

PLAIN CYLINDRICAL GRINDERS

8x18" Gtt Plain Cylindrical, m.d.
No. 5 Brown & Sharpe Plain Cylindrical, m.d., 1942
6x15" Cincinnati Plain Hydraulic, m.d.
8x18" Cincinnati Model EA, m.d.
8x18" Cincinnati Model ER, Plain Hydraulic, m.d., Filmatic Spindle
6x18" Landis Type C Hydraulic, m.d., late
8x18" Norton Plain Grinder, m.d.
10x18" Cincinnati Plain Hydraulic, model ER, m.d., Filmatic Spindle, 1943
10x18" Cincinnati Model EA, m.d.
10x18" Norton Type C, m.d., latest
10x36" Cincinnati Hydraulic, m.d.
10x36" Norton Type C, m.d.
10x72" Landis, m.d.
12x36" Landis Plain Self-Contained, m.d.
12x96" Landis Self-Contained, m.d.
14x52" Norton, motorized
16x72" centers Type C Norton Semi-Auto., Hydraulic
16x72" Landis Plain Self-Contained, single m.d.
16x96" Cincinnati Plain Cylindrical, m.d.
18x36" Landis Type C, m.d.
18x72" Norton Type C, mechanical, m.d.
20x120" Landis Plain Self-Contained, m.d.
25"x72" Landis Type C, m.d.

INTERNAL GRINDERS

Type 1G 10S Greeby, m.d.
No. 5 Bryant, m.d., latest
Model 5V Bryant, m.d.
No. 1G—18" Bryant m.d., hydraulic Hole Grinder
No. 10CR1G Bryant, m.d., latest
No. 1G—22" Bryant, m.d., latest
No. 1G—30" Bryant, m.d., latest
No. 1G-A—28" Bryant, m.d.
No. 24—36" Bryant Hole & Face Type, m.d., late
No. 24P—28" Bryant, m.d.
No. 24—21" Bryant, m.d.
No. 24-L-36 Bryant, m.d., late
No. 24-LW-36 Bryant, m.d., late
No. 44 Heald Facing Type Borematic, m.d.
No. 64B—18" Van Norman Automatic Oscillating Radius, m.d., latest
No. 70A Heald, m.d., latest
No. 72A Heald Sizematic, "Duplex", m.d.
No. 72A Heald Gagematic, m.d.
No. 72A3 Heald Full Universal, m.d.
No. 72A3 Heald Gagematic, m.d.
No. 72A3 Heald Sizematic, m.d.
No. 72A3 Heald Plain, m.d.
No. 72A5 Heald Sizematic, m.d.
No. 72A5 Heald Plain, m.d.
No. 73 Heald Airplane, m.d., latest, new
No. 74 Heald, m.d.
No. 75A Heald, m.d., latest
No. 72 Heald, Plain Long Base, m.d., 1941
No. 78 Heald Centerless Cylinder, m.d.
No. 81 Heald Gagematic, Sizematic, m.d.
No. 81 Heald Plain & Sizematic, m.d.
No. 104 Rivett, m.d.
No. 172 Heald Plain Adjustable Gap Hydraulic, m.d.

THREAD GRINDERS

No. 33 Excello Precision, m.d.

SNAG GRINDERS

Type No. 50—7½ H.P. Standard Elec. Tool Co. Double End, m.d.
25 H.P. U.S. Elec. Co., Heavy Duty Double End, m.d.

UNIVERSAL GRINDERS

10x24" Landis Type C, m.d.
12x48" Norton, m.d., latest
14x48" Landis Universal
14x36" Norton, m.d.
14x72" Norton Universal Hydraulic, m.d.

KEYSEATERS

No. 2 Niles Cotter & Keyseat Milling Machine, m.d.
Norton, m.d., thru reversing gear box

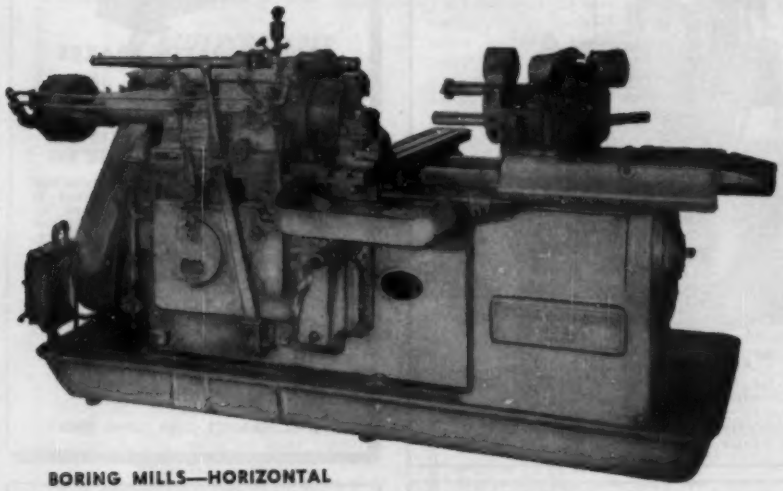
SEND FOR COMPLETE STOCK LIST

THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue Cincinnati 29, Ohio MElrose 1-1241 "TWX" CI-174
CABLE ADDRESS EMCO

MOREY *for half a century*

Quality • Reliability • Value

18 LATE TYPE POTTER & JOHNSON
4D AUTOMATIC CHUCKING MACHINES



BORING MILLS—HORIZONTAL

GIDDINGS & LEWIS 25 RT; 2½" bar; late type.
5" bar SELLERS, table type; late type.
4" bar SELLERS, table type; late type.
3" bar UNIVERSAL; late type.

RADIAL DRILLS

AMERICAN 4' arm 11" col. Triple Purpose.
AMERICAN 6' arm 17" Col. Hole Wizard; late type.
AMERICAN 7' arm 16" col. Triple Purpose.
CARLTON 6' arm 19" col. Plain; low hung drive.
CIN. BICKFORD 24" Super-Service; late type.
CIN. BICKFORD 28" Super-Service; late type.
CIN. BICKFORD 2½" arm 7½" col. Super-Service H.S.; late.
CIN. BICKFORD 4' arm 9" col. Super-Service.
CIN. BICKFORD 4' arm 11" col. Pl; oil groove base.
CIN. BICKFORD 6' arm 15" col. Univ.; oil groove base.
FOSDICK 6' arm 17" col.; H.S.; late type.

GEAR EQUIPMENT—GLEASON

#1 Surface Hardener; late type.
3" Straight Bevel Gear Generator; 4-7/16" P.D., 8 D.P.; late.
3" Spiral Bevel Gear Generator; 4-7/16" P.D.; 12 D.P.; late.
#6 Straight Bevel "Revacyle"; 450 D.P.; late type.
#7 Hypoid Cutter Sharpener; max. dia. 6" R or L hand; late.
#7A Gear Generators; late type.
11" Straight Bevel Gear Generator; M.D.
12" Straight Bevel Gear Generator; fully automatic.
#12 Tool Sharpener; late type.
12" Spiral Bevel Cutter Sharpener; max. dia. 16" late.
#16 Hypoid Gear Generator; 2½ D.P.; Production Type; late.
15" Spiral Cutter Grinder; motor drive.
15" Spiral Bevel Gear Generator; max. dia. 19¼"; 3 D.P.; M.D.
25" Spiral Bevel Gear Generator; max. dia. 34"; 1½ D.P.; M.D.
24" Straight Bevel Gear Planer; max. dia. 28"; 1½ D.P.; M.D.
37" Spur & Straight Bevel Gear Planer; max. dia. 43"; 1 D.P.; M.D.
54" Spur & Straight Bevel Gear Planer; max. dia. 60"; 3½ D.P.; M.D.

GEAR EQUIPMENT—HOBBING

BARBER COLMAN Type A; cap. 12"x12"; 3 D.P.; with differential; late.
BARBER COLMAN Type S Auto.; 1" dia., brass 24 D.P., steel 32 D.P.; late.
BARBER COLMAN Type T, 12"x12" cap., 3 D.P.; with differential; late.
BARBER-COLMAN Type V; 8-10, Vertical, cap. 8".
BARBER COLMAN #17, cap. 8"; 2½ D.P.; 5¾" hole thru spindle; M.D.
GOULD & EBERHARDT #8H Univ.; cap. 12"; 4 D.P.; heavy duty; M.D.
GOULD & EBERHARDT #24H Univ.; cap. 27"; 3½ D.P.; late type.
GOULD & EBERHARDT #24H Univ.; extended hob spindle.
LEES BRADNER 7A-8 Spdle. Rotary Hobbers.
NEWARK #5 for helical worm wheels & spur gears.

TURRET LATHES—LATHES

AMERICAN 24" x 240" Engine Lathe; late type.
LODGE & SHIPLEY 16" x 54" Engine Lathe; late type.
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GISHOLT 4R Univ. Saddle Type Turret Lathe; late type.
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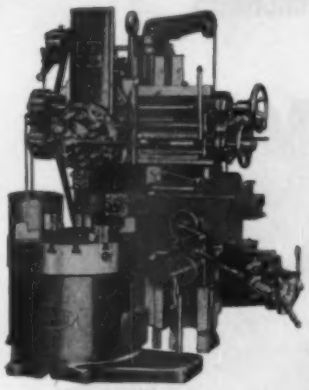

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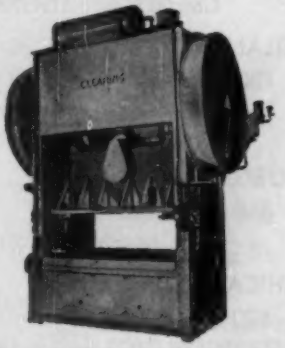

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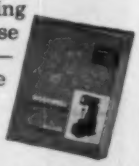

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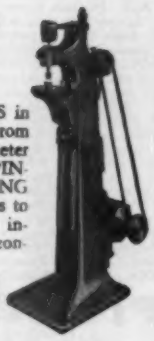

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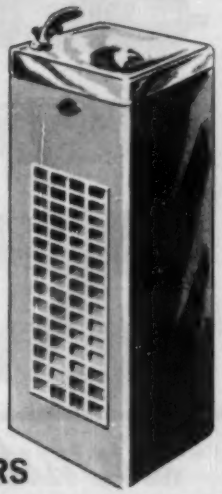

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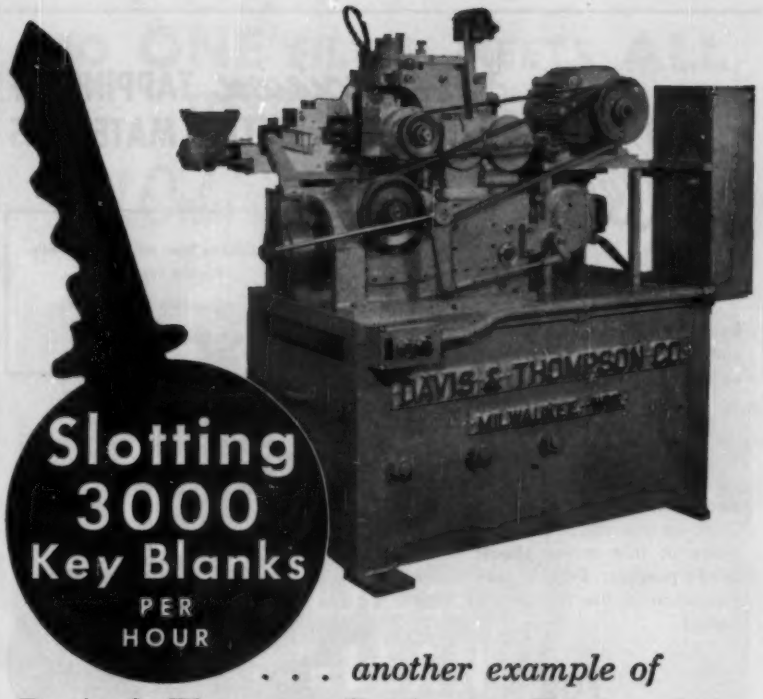

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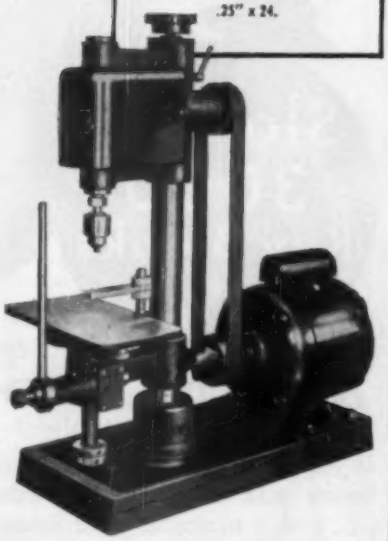

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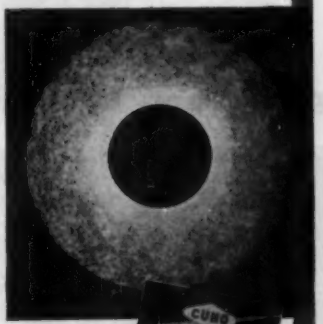

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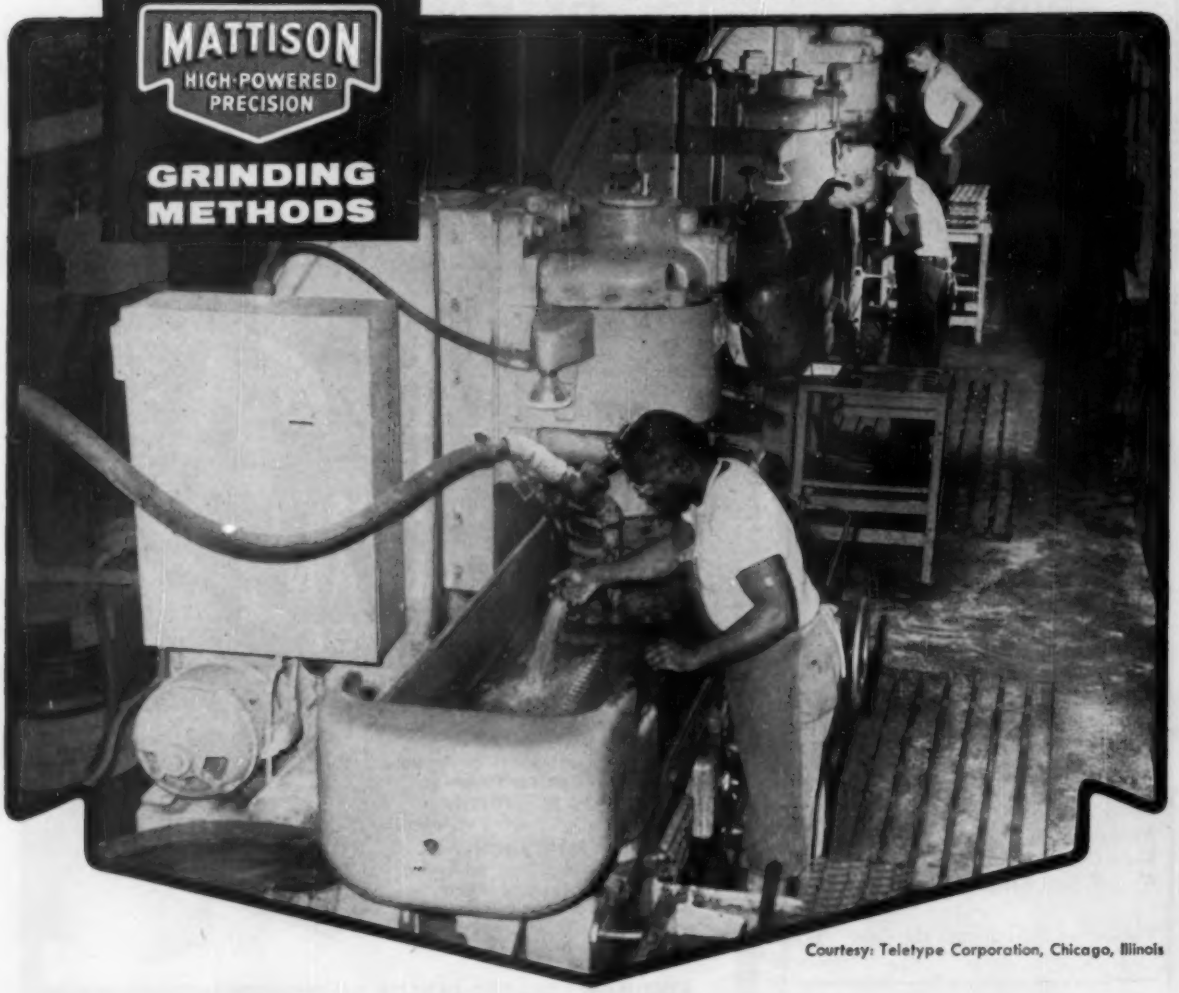
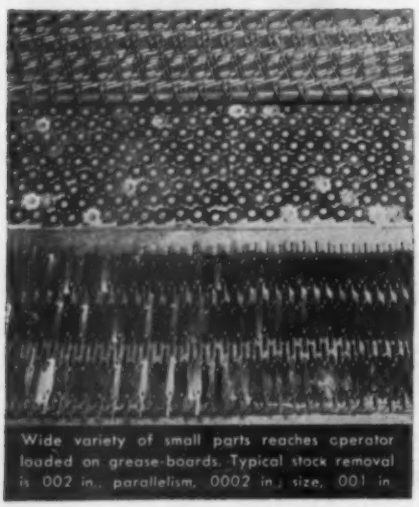


Courtesy: Teletype Corporation, Chicago, Illinois

Grease-board loading, high-powered surface grinders speed production of precision small parts



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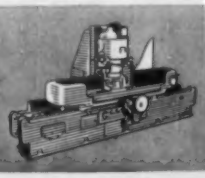
MACHINE WORKS
ROCKFORD ILL. U.S.A.



HIGH-POWERED
PRECISION
SURFACE
GRINDERS

O K carbide tool bores 2 diam, turns shoulder and bottom, in less than 2 min.

combination boring heads
multi-diam tools
trepanning tools
form cutters
gang mills
reamers

At the Waterbury plant of Vickers Incorporated, machine time is drastically reduced with this special O K carbide head for boring and counterboring cast iron hydraulic pump bodies. A single plunging cut completes four operations at the same time.

You can buy similar O K multiple-operation tools, boring heads, reamers, trepanning tools, gang mills for $150.00 to $200.00. An investment that pays for itself many times over, generally the first week the tool is on the job. Engineering service is free. Write for Book of 50 Engineering Prints of Multi-diam Tools.

modern milling cutters
for modern milling machines

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and there's
only one trade-mark
like this ☞

TIMKEN®

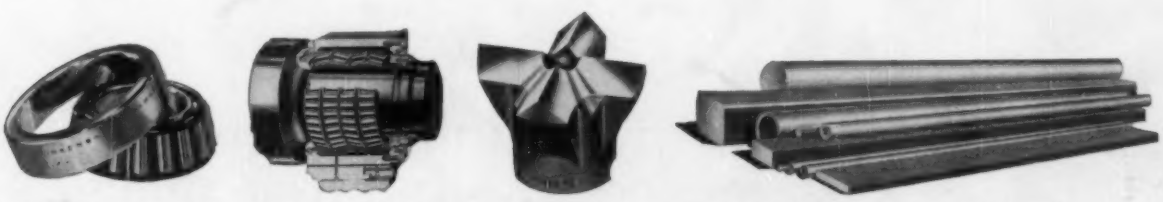
THERE'S only one Timken and it's a registered trade-mark—stamped on every Timken Company product. It means the name "Timken" is the property of The Timken Roller Bearing Company *alone.*

It means even more to you. When you say "Timken", you know you'll get the highest quality tapered roller bearings, fine alloy steel bars, seamless steel tubing or removable rock bits — all products of the Timken Company. Industry has made it a habit to look for the trade-mark "Timken" when looking for quality and value. It's a name with more than 55 years experience behind it. A name 15,000 Timken Company employees work very hard to keep on top.

That's why it pays to remember that "Timken" is a trade-mark, not just a type of product.

So to be *sure* you get the best, look for the trade-mark "Timken". It's your assurance of quality.

The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".



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